The Practical Teacher

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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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WHAT DOES FRÖBEL TEACH US?

BY EMILY A. E. SHIRREFF.

President of the Fröbel Society.

III.

EDUCATION AS THE HARMONIOUS DEVELOPMENT OF ALL THE FACULTIES.

OUR last paper dwelt upon Fröbel's first great principle, that 'Education must be according to nature,' and taking each division of human faculty—the physical—the intellectual—and the moral—we found that the indication afforded by natural instincts or aptitudes gave the only safe clue to the right method of training.

We now come to Fröbel's second axiom, namely, that *Education must be the harmonious development of all the faculties*, that what we are forced to separate for investigation must be combined in action, since the influence of the one upon the other is increasing and all powerful.

This principle is in truth but a corollary of the first. If we educate according to nature she must be our guide, and we must search out and work upon all the indications she affords. We thus at once get rid of all the infatuation for the 'beggarly elements' of knowledge committed to the memory, and address ourselves to train and discipline the human creature in the fulness of his nature, moral, physical, and intellectual, to fit him for the work of life; for action or for contemplation, for brain-work, or work of the hands.

We have, then, first to ascertain what powers these are that we have to deal with. It is an easy thing to bring a child to school and to teach him the '3 R's,' with such other scraps of knowledge as time and circumstances will allow, and doing so, more is also done, whether we will or no, since fortunately bringing a child in any degree under order and discipline touches a higher chord than alphabets and cyphering can sound, and thus incidentally real education is begun, even while its full scope is unthought of, and all the more delicate physical training, all the direct exercise of intellectual faculty, all the true life-governing power of moral faculty are left aside—incidentally, as I said above, the higher work is begun, but not as the educator's first aim and purpose.

Fröbel, on the other hand, never forgets this aim. He trains the physical power through healthy exercise, through delicate manipulation, through increasing acuteness and accuracy of sight and hearing in work and the play of rhythmical movements—all of which begin at the same time to draw out the intellectual faculty, to cultivate observation, discrimination, and judgment, faculties which in their full development will measure the power of the artist, the student, the man of science.

And again, and through all, the conscious drawing-out and strengthening of the moral faculty will continue. Obedience, the child's first virtue, will be a necessity of his life, because law is always present amid the freest play, and the self-control that obedience calls for strengthens the will, while it makes the first whisperings of conscience to be daily better heard; and lastly the natural faculty of reverence, the root of religion, is kept ever alive under a system in which superior knowledge orders all things for the child's happiness, exercising the activity of mind and body in which he delights, giving him an ever-increasing sense of power in using his own faculties, and at the same time a growing respect and affection for the wisdom and goodness by which all this happy life is ordered.

The Kindergarten, which is the practical illustration of Fröbel's theory, keeps us perpetually in mind of both the principles we have been considering. In all things it follows Nature, and so doing, it neglects no part of the human constitution while cultivating another.

When you come to study the games and occupations closely, as I trust you will do, you will find that whether you take them singly or in combination of several in groups, each has its distinct purpose, its leading aim; but ever with this, we find some other object kept in view. Take, for instance, the very earliest Kindergarten toys—the three coloured balls; while the child is led to make his first attempt at discrimination, exercising an intellectual faculty that grows more and more important in after work, he is also improving his sense of sight and learning to use his hands deftly in given directions and at word of command. In the same manner when building with the cubes, or forming the first simple patterns, he is making progress in manual dexterity and

accuracy while beginning at the same time to count, and learning the names of lines and geometrical figures. Again in embroidering, while the first purpose is the manual skill, he is copying or combining lines and figures that require some mental effort to produce and that bring memory or imagination, or the sense of symmetry or beauty, into play. So it is throughout the method, the mental and physical training are carried out together, as essential parts of one design. We do not hear in a Fröbelian school of manual training as a distinct branch of education; it is woven purposely and inextricably with discipline of the mental faculties. Accuracy of observation and of thought and reasoning are cultivated as essentials to the success of the practical art, while hand and eye are trained in other exercises which deal with arithmetic and the elements of geometry.

Nor let it be supposed that the moral discipline is neglected or left apart as a thing of rules and precepts. All that is learnt by the little children is learnt in common; the success of the whole game depends on the spirit with which each enters into it; good humour, good temper, gentleness, and patience are essential to the enjoyment of all, while the guidance coming from the one source of wisdom and authority, the child's natural reverence, as we said before, is called forth, and obedience, seldom enforced, is never questioned. Of course there are less happy temperaments, and there are among children promiscuously gathered together many evil habits tolerated, if not engendered, by home mismanagement. But the influence of the Kindergarten tells daily upon them, and punishments are of the mildest kind and most rarely needed; partly for the reason given above, and partly because the children are happy. There is none of the irritation of uncongenial tasks which seem to children absurd as well as odious, because their purpose cannot be understood. The Kindergarten children are actively using their own faculties in the way they like best, for it is daily revealing something more of what they want to know and to do, and of their own power to do it. The pleasure of knowing feeds the wish to know, and thus daily, insensibly, the teacher's greatest difficulty, that of creating a desire to learn, is overcome. The child, as we have said before, is naturally active. This is the first instinct we observed in our study of child-nature. But it is not physically active only, but mentally. To aid spontaneous movements, and gradually enlarge their range, is an easy and obvious thing to do; but we must remember that the germs of mental activities are springing to life at the same time, and the child's looks, and the movement of his hands generally betray the want, or the feeling that belong to the hidden and as yet unconscious life. In Fröbel's 'Mütter und Köse Lieder' we see how he would have mothers draw out and cultivate these manifestations, and, later on, Kindergarten games, accompanied with songs, and dramatising some simple occurrence of human or animal life, exercise the limbs and senses of sight and hearing, and give scope to the imagination which wakes so early in children, and is in general so little heeded. Fröbel tells us repeatedly to watch the play of children, and if we do, we find how active the imagination is, how they spontaneously become actors, and fit the action and the expression to the scene they reproduce. Objectors again ask us why then we cannot be content to leave them to their own play? Doubtless we should often do so, but by directing it we make the play educational to certain ends, and we do not impair the pleasure, for never yet was it seen that a lover of children was not welcome among the players, and what was random fun before, falls into pleasant order. The music and the rhythmical movements are felt to be new enjoyments, and the stories that lead gently to something akin, though new, to the child's experience, are an inexhaustible source of delight, and they form an essential part of the Kindergarten life.

It is hardly needful to dwell upon the increased moral influence given to the teacher by participation in the play; and the habit of looking to her as the guide, as the judge in all doubtful points, as the one who is constantly giving pleasure while giving instruction, and making the charm of order and of good companionship to be felt, soon tends to form associations that will be of life-long value, and thus, acting under the guidance of nature, we achieve an educational triumph. Contrast this combined discipline and activity of all the faculties with the common school life, when the moral principle is taught apart in a dull maxim, and the physical training is a monotonous drill, and the intellect is fed upon spelling books and arithmetical tables, and surely the gain must be obvious to all.

Once more, then, we find that Fröbel has enunciated a great truth, and illustrated it in his K.G.; and that, side by side with his first principle of 'education according to nature,' we must admit the second, which declares 'education to be the harmonious development and careful direction of all the faculties of the child's complex nature.' The two principles hang indissolubly together. When we neglect the second the indications of nature are set aside and her precepts violated, and when we neglect nature and choose conventional guides we fall into one-sided treatment, and harmonious development is impossible. Then it is that we sometimes find bodily care so predominant that the physical needs obscure the spiritual; or, again, intellectual discipline so exclusively attended to, that physical and moral considerations are both set aside; or even moral training guilty of usurpation, when it forgets that a healthy frame facilitates all good work, while the most devoted labour in the loftiest cause may be perverted and worse than useless when reason or knowledge or common-sense are neglected.

It is probable, indeed, that ignorance never goes quite so far as to contend that those various phases of human culture can be made altogether independent one of the other; that we could, for instance, according to our will or caprice, make a human creature either physically or intellectually or morally strong to the exclusion of all other training; and yet such a conclusion was practically acted upon in former days when dealing with education for one class or another, and for one sex or the other; nor as regards women, at least, is the notion without its supporters even now. In all such discussions it is obvious that the eternal confusion between instruction and education is at the root of the mischief, and that in looking to the future needs of culture, position and the conventionalities of life are what are taken into consideration, not the constitution of human nature as ordained and gifted by God for the universal work and duties of life.

To aid in developing that constitution is our appointed task which, as Fröbel teaches us, must begin with the first dawn of life. Let us follow that teaching, and education and instruction will fall into their due places, essential one to the other, but never to be confounded. The one varied

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in its scope and objects according to the endless inevitable variations of human circumstances, position, and desires; the other fixed in its fundamental principles, because based on natural law. The one ever increasing man's knowledge of, and power, over the outer world; the other giving him *possession of himself*. While, therefore, it is urgent to bestow the former with the utmost liberality circumstances allow, to withhold the latter is a sin against Nature.

(To be continued.)

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DECORATIVE NEEDLEWORK.

BY MAY MORRIS.

EMBROIDERY.

Embroidery Stitches.

The slight sketch in the preceding paper of the history of embroidery, will give some idea of what can be done and what has been done with the needle alone, or with the needle and a few tools of the simplest description. There are two sides to the art of embroidery: it may be considered as a pictorial art in which the material used serves merely as a surface or ground to be entirely covered with work, like the canvas of a picture; it may also be considered as a decorative art by means of which a woven stuff is ornamented with borders and designs more or less elaborate, but the textile used not playing so entirely a subordinate part as in the former case. The more important and pictorial side is usually left in the hands of professional workers of experience and skill, but the decorative and more popular work is quite within the scope of amateurs, and is indeed often more beautiful as mere ornament, though its intellectual value may not be so great.

Embroidery can be worked loose in the hand, or stretched in a simple frame, the stitches for the two methods sometimes varying. Fine and elaborate work, especially where gold thread is used and much moulding or relief required, should always be put in a frame, a smooth and evenly tight surface being very necessary to this class of work, as well as greater freedom of hand. Some stitches, on the other hand, are only suitable for work done loose in the hand, such as chain stitch (when done with a simple needle) and several other loop stitches, also darning, stitching, and some others.

Before setting to work, the learner has a few technicalities to master, and in the course of her work will encounter many difficulties, to be gradually overcome by practice and carefully corrected errors. For instance, there are certain definite stitches or sets of stitches to be learnt. These are learnt far easier by word of mouth than by book, of course, and it will not be advisable to burthen the memory at the outset with a whole column of apparently fantastic names of stitches. To take them easily and quietly, I will devote the rest of this paper to *chain* and other 'looped' stitches, and the various purposes to which they have been and may be put.

Chain-stitch has been so-called because it imitates, more or less, the links of a simple chain. It is the foremost and most familiar of all similar stitches. It has a very definite character of its own, and though apt to become a little monotonous, is from its laborious and enduring nature well suited to work that may be subjected to much wear and tear. In the accompanying diagram it will be seen that each little loop grows out of

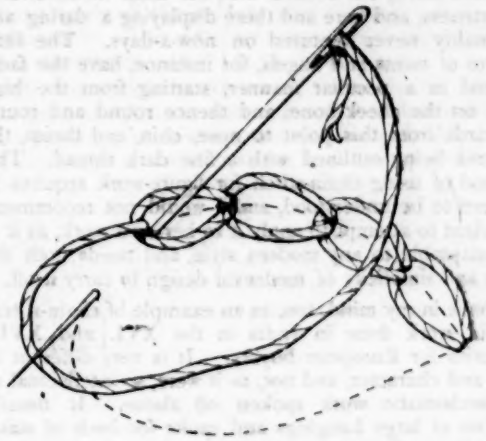

Fig. 1.—Chain Stitch.

the last; the needle follows the exact direction in which the line of stitches is to lie. Some of the most famous work in the world has been wrought in this stitch, and many famous pieces remain to show us what can be done in the way of minute and laborious work combined with good design and beautiful colour.

The best way of using chain-stitch when the design is required to be filled with solid work is to start round the outline and work from without inwards, the result when finished being a series of curved lines, as indicated by the dotted lines in the diagram.

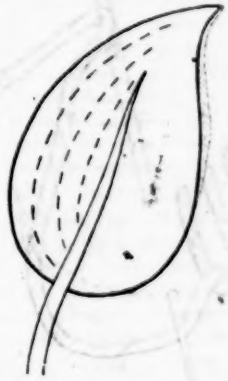

Fig. 2.

A good look at a piece of Eastern chain-stitch embroidery will teach more than any descriptive writing, and supposing that you have such a piece before you, in the show-case of a museum, or better still, in your own hands for closer inspection, you will note with what certainty and regularity the little flowers are worked, and how suitable this stitch is for long stems and lines. A great deal of the Eastern work on fine muslin that we see in such abundance in all shops now, is worked in some kind of *tambour-frame*, that is, on a rather open

stuff stretched tight, the thread being passed through and back with a hook or tambour-needle. It is not difficult to tell this work from the slower needlework, as the former has a certain unmistakeable evenness and flatness, which the other has not. The great cope of Syon that I have referred to already, is principally worked in chain-stitch, but worked with the most inconceivable minuteness, and here and there displaying a daring and originality never ventured on now-a-days. The little figures of saints and angels, for instance, have the faces worked in a peculiar manner, starting from the high light on the cheek-bone, and thence round and round outwards from this point to nose, chin, and throat, the features being outlined with a fine dark thread. This method of using chain-stitch for figure-work requires to be seen to be understood, and I would not recommend a student to attempt to apply it to her own work, as it is not adaptable to any modern style, and needs both the *verve* and simplicity of mediæval design to carry it off.

I have in my mind, too, as an example of chain-stitch, certain work done in India in the XVI. and XVII. centuries for European buyers. It is very different in style and character, and not, as it were, so intellectual as the ecclesiastic work spoken of above. It usually consists of large hangings and quilts for beds of state, worked on a fine cotton ground entirely in chain-stitch of one colour. Very rich and effective does this work look in a brilliant yellow with an irregularly *stitched* background pattern also in yellow. They were ordered for state gifts or marriage gifts, with the centre sometimes occupied by the arms and device of the prince or lord for whom they were intended, elaborately interwoven with the design.

Of other stitches looped on the surface we have *button-hole stitch*, sometimes prettily used for the outlining of flowers and leaves. This stitch does not allow of

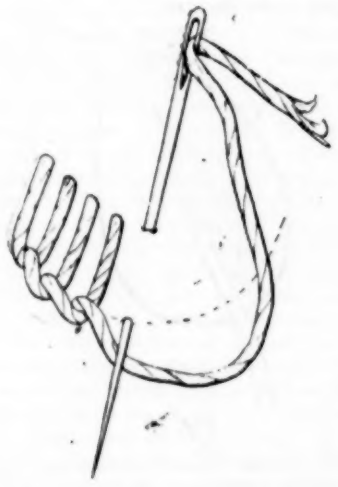

Fig. 3.—Button-hole Stitch.

much variety, and being rather hard and unpliable, looks best in combination with other stitches. The same may be said of different lace stitches, which look well in moderation and add variety to the work, but are a little wearisome if too much used.

Feather-stitch, familiar to the seamstress, is sometimes used for edgings and borders, and sometimes as a light filling of stems.

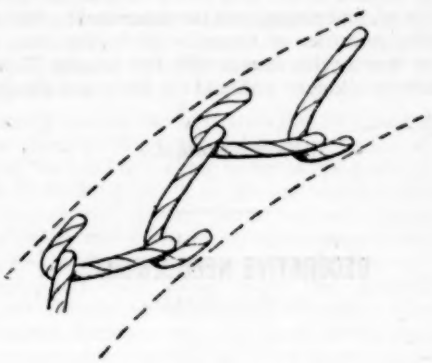

Fig. 4.—Feather Stitch.

It bears no resemblance to the 'feather stitch' of the old writers, which is another thing altogether.

Knotting or *French Knot* consists of several loops taken round the needle and secured by a stitch. This is effective for thick raised work, filling of flower centres

Fig. 5.—Knotting.

and so forth, but is also seen in very flat work, such as some of the old Chinese work, which is sometimes composed entirely of very fine knots in different shades of silk. It is also seen used with comical effect in certain late English work, for hair, for trees, or sheep's fleece, or anything, in short, in which the embroideress thought a highly broken or granulated surface would help out her descriptive effects. Such 'effects,' however, are, to my thinking, in bad taste and out of place in embroidery, where even in the pictorial side of the art, natural objects should be interpreted by bold and skilful drawing, and no attempt at faithful copying be made.

(To be continued.)

CONVERSATIONAL SCIENCE LESSONS.

BY DR. ROBERT STEELE, B.Sc. F.C.S.

Lesson XI.—Clothes.

Summary.—How to prevent the boiling water from cooling so quickly. Use of clothes. Silk, woollen, cotton, linen. Clothes do not let the heat quickly through them.

Materials.—A flask of boiling water. The air thermometer. Squares of woollen silk, cotton, and linen stuffs.

Introduction.—Recapitulate last lesson. Write on the board, 'Boiling water quickly loses its heat, and cools.' How shall we stop it from cooling quickly. Cork the flask. Yes, but it cools from sending out its heat all round. Put something round it, the heat cannot get through. Let us try something.

I. Wrap a duster round the flask and hold it near the air thermometer. There is no effect. Take away the duster. There is a great effect. What has the duster done? Kept in some of the heat. Wrap a silk handkerchief round it. Then a linen one. Note the effects. Call the duster, &c., the clothes of the bottle, and say that its clothes keep the heat in.

II. Lay a square of flannel on the top of the air thermometer. Put the bottle of water on this for a short time, 20 seconds say. Note the depression. Mark it on a paper scale. Remove the flannel, and let the water rise to its original place. Lay a square of linen in its place. Again replace the hot water bottle for 20 seconds. The class will note which allows most heat to pass through. The linen. Which allows most heat to pass from your body? Linen.

III. Repeat the experiments with silk and cotton.

IV. Clothes are used in winter to keep in the heat of the body. Question on this. Get names of other materials. Which are warm things? Why are they called warm things? Recapitulate.

Lesson XII.—Sunlight.

Summary.—Comparison of light and heat of a candle with that of the sun. Other sources of light. Effects of light. Transparent substances. Opaque substances. Partly transparent bodies.

Materials.—(The lesson must be given in a room into which the sun is shining directly.) A candle, glass—ordinary and coloured.

Introduction.—Light the candle. Recapitulate its properties. It gives out light and heat. A red hot poker gives out light and heat. Name other things that give out light and heat? Gas, fire, oil, the sun, &c. We are going to speak of one of these—sunlight.

I. Compare the light and heat from a candle and the sun. Put it out of the sunlight. Hold the hand so that one side gets heat from the candle and the other the sun. Which side is hottest? Hold a slate so that one side gets light from the sun and the other from the candle. Which gets most light? Set the candle in the sunlight. The flame is hardly seen. Blow it out. The light in the room does not seem less. Sunlight is greatly brighter than candle light. Write this on the board.

II. Effects of sunlight. The shining of the sun is day. When he is not shining on us it is night. We get warmth from the sun. Plants will not grow well if they get no sunlight. If a plant is covered from the light it becomes white, *e.g.*, celery, onion bulbs. Get these and other effects of sunlight from children.

III. Catch the sunbeam on a sheet of paper, &c. Put a plate of glass in the way. Show that the glass allows nearly all the light to pass through. It is called transparent. The air allows sunlight to pass through. It is transparent.

IV. Put a slate in the way of the sunbeam. It does not allow the light to pass through. It casts a shadow. A shadow is a place where there is less light than at other places round it. A slate is not at all transparent.

V. Put a piece of coloured glass in the way of the sunbeam. The class will see that the light is not so bright in the place covered by the glass as the rest of the paper. The glass does not allow all the light to pass through. It is partly transparent. (If glass is not at hand, a sheet of coloured gelatine may be used.)

Recapitulate.

Lesson XIII.—Reflection of Light.

Summary.—The rays of light fall on a mirror and are reflected. The surface of the mirror must be smooth. It must be opaque. The distinction between shining by reflected light, and by self-emitted light.

Materials.—Looking-glass. Saucer of water, sheet of paper, a candle, a marble.

Introduction.—Lay the glass in the sunlight. Recapitulate last lesson. Question as to transparency. Why is it not transparent? Use of the back? In moving the glass some children will observe the reflection on the walls, &c. Speak of it. Why is the light just in that patch?

I. Lay the glass in the sunlight. The light strikes on it, goes through the glass, meets the back, cannot go through, rebounds off. These facts are to be observed by the class. Illustrate rebound by shooting a marble at a board or book. The place it goes to depends on the face of the book. Move the book round. The direction after rebound moves. Tilt the glass, the reflection moves. Speak of it as reflection, and of rays of light. Make the class familiar with their use. Write 'The rays of light falling on a mirror are reflected.'

II. Replace the glass by a saucer of water. The reflection occupies the same position. It is not so bright. Blow on the water. The reflection disappears. The water becomes smooth, the reflection returns. Repeat this till the class associate a smooth surface with reflection. Write 'The surface of a mirror must be smooth.'

III. Replace the water by a sheet of white paper. Hardly any reflection is seen. The paper is much brighter than the mirror or water. The reflection is in a different place. The surface of the paper is not smooth, but is made up of small rough places.

IV. The paper is shining. Why? Is it giving out light of its own? No. Whose then? The sun's. Point out difference between candle and paper in this respect. Get list of things giving their own light. Refer to sun and moon. Explain how the moon shines. Draw diagrams on the board to illustrate moonlight.

V. If light falls on any body not perfectly smooth, it is reflected to all sides. This is how anything is seen.

Recapitulate.

Lesson XIV.—Shadows.

Summary.—A shadow is caused by the absence of light. Light moves in straight lines. Day and night. An eclipse.

Materials.—Slate, air thermometer, mirror, ball.

Introduction.—Recapitulate last lesson. Question on transparent and non-transparent substances. Hold up a slate, &c. Is this transparent? No. Why? We cannot see through it. Another reason? It casts a shadow. Show its shadow. Draw on board rays of light coming from sun to stick then reflected, while the others go straight on to the screen. Bring out that a shadow is not anything on the screen, but simply there is not so much light there as anywhere else where the sun is shining. There is not so much heat there too. Show this by the hand and air thermometer.

I. Notice the shadow of the window frames, and the edges of the sunbeams. The edges are straight from the frame to the screen. Show in various ways that 'light moves in straight lines'; write it on the board.

II. Hold the ball in the sunbeam. One half is bright one half is darker. Call it daylight on the bright side and night on the dark.

III. Let one child hold the ball and another throw a reflection of the sun on the ball. Call the mirror the moon and the ball the earth. Tell the child holding the mirror to hold it in the shadow of the ball and throw a reflection on the ball; he cannot. Obtain from the class the reason, because no light falls on the moon. When the moon gets in the earth's shadow an eclipse of the moon takes place.

Recapitulate.

Lesson XV.—A Model Camera.

Summary.—Construction of a model camera. The picture on the screen is inverted, very faint, and in its true colours. Light moves in straight lines.

Materials.—A round collar-box, a sharp knife, thin tissue paper, rubber, band, thread, &c. (The teacher would do well to make one up before coming to the class, as well as the one made in class.)

Introduction.—Speak of the photographer's visit, arranging the sitters in front of a box, covered with cloth; the name of it? Camera. Explain his going under the cloth was not taking the photo. Ask if anyone has seen under the cloth. Explain that we are making a model of a camera.

I. Take the bottom part. Stretch some thin tissue paper over the open end tightly, and slip a rubber band over it. Wind some thread round it and fasten. Cut a small eye-hole in the closed end.

Make a round pin-hole in the middle of the closed end of the outer part. See that the edges of it are smooth. Slip the inner part in its place, and look through the eye-hole at any bright object. As the eye becomes accustomed to the faint light a picture is seen, upside down, on the tissue paper.

II. It is very faint. The light that falls on the pin-hole is all that enters, and this spreads inside. So the light at any place is fainter. Give illustrations of this. Three lumps of sugar make a cup of tea very sweet, but they will not sweeten a jugfull, &c. There is a strong light at the hole, but it is too much spread out.

III. It is inverted because the top ray is going downward through the hole and touches the bottom of the screen. Draw the ray first to the hole from the object, then produce it to the screen; it touches the bottom. Draw a ray from the bottom of the object to the hole, it reaches the top of the screen.

During this part several children should be allowed to look through the camera at some object like a brightly illumined window. The lesson should be given when the sun is shining (if possible).

Recapitulate.

(*To be continued.*)

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NEEDLEWORK FOR PUPIL TEACHERS.

BY MISS SOPHY LOCH,

Examiner of Needlework to the London School Board.

Shirt—(*continued*).

11. I propose now to describe in detail the best way of arranging the gussets which are put to strengthen the side seams of a shirt, and which are hence called 'hip-gussets.' These are generally formed from the diagonal of a square piece of cloth, and must of course be large enough to fulfil the purpose for which they are intended. We will now suppose the gussets have been cut off, and are ready for folding.

Turn first the two short sides ot the gusset *once*, pressing the material very firmly, to make it lie as flat as possible. Cut off the little pieces which project at each end. (See fig. 33.)

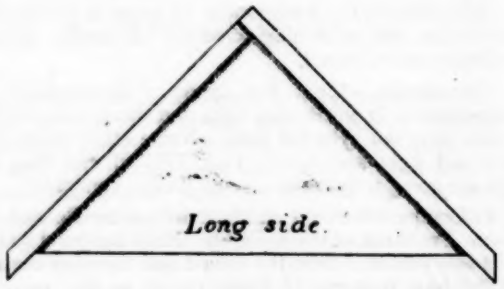

Fig. 33.

Turn down the long side once, and again cut off the projecting pieces. Fold the gusset so that letter A

touches A (fig. 34), and letters B touch B on each side (fig. 35).

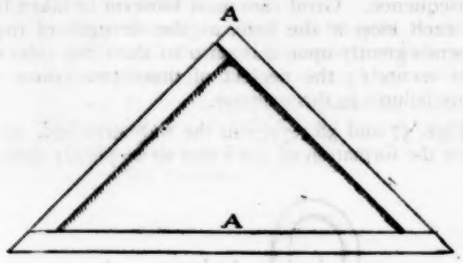

Fig. 34.

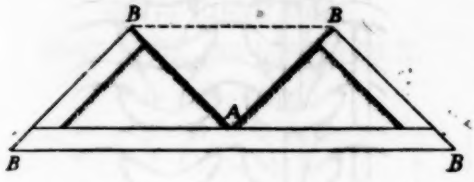

Fig. 35.

The gusset is now ready to be inserted into the side of the shirt, which has been sewn and felled. The great difficulty in placing gussets is to make them lie perfectly flat over the seam of the garment. To ensure this the seam is cut across, as in fig. 36 (*a*), when the material is cut it will appear as in this diagram. Fig. 36 (*b*) shows the raw edges of the side slit turned ready for hemming. It will be noticed that the hems are graduated. Fig. 36 (*c*)

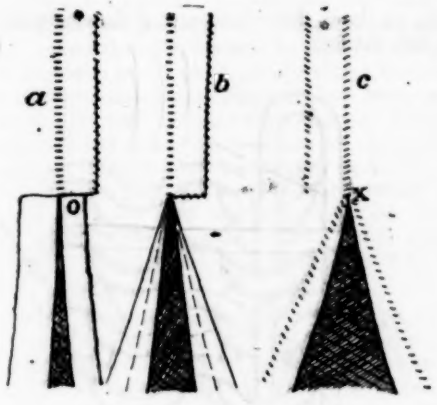

Fig. 36.

(*a*) Bottom of seam cut across; wrong side. (*b*) Sides of opening tacked; wrong side. (*c*) Sides hemmed; right side. (*x*) Where gusset is inserted.

shows the seam of shirt on the right side, with the side slit hemmed and ready for the gusset to be inserted. It is not necessary to hem that part of the side slit which will eventually be hidden by the back part of the gusset. Should the worker wish to turn the side slits on to the right side of the shirt and stitch them instead of turning them on to the wrong side and hemming them, the turned-down material marked o in fig. 36 (*a*) should also be cut across. Great care must be taken in doing this not to cut through to the right side.

The point of the gusset must be inserted at *x* in fig. 36 (*c*), the latter is then sewn to the garment on the right side as far as the crease which runs across it, represented by dotted line in fig. 35. Opinions differ as to the best place for beginning the sewing; perhaps the neatest way is to fasten on not at the point of the gusset, but at the side, when the same piece of cotton can be used both for the sewing in the front and for the hemming at the back. One or two extra sewing stitches might be put at the point of the gusset, as that is the part which has to bear the most strain. The back of the gusset must be carefully fixed before it is hemmed down. That part which falls over the seam should be fixed first, and then each side carefully tacked. In this way it is easier to get the gusset into the right position, as the material here being on the cross is liable to get unduly stretched. After being carefully tacked the gusset must be hemmed on to the garment. The only thing that now remains to be done is to stitch across the gusset on the right side, about two or three threads from the folded edge. This strengthens the gusset, and makes it lie perfectly flat.

12. The making of the shirt is now complete, with the exception of putting in the sleeves which (it will be remembered) have been previously made, and marking the initials of the intended wearer. The latter stitch has been fully described in a previous paper, and need not therefore be further alluded to.

The putting in of a sleeve which exactly fits the armhole will be first described, and then one which requires a few gathers at the top of the shoulder.

How to put in a Sleeve without gathers.—Turn the garment over to the wrong side; take up the sleeve and insert it into the armhole so that the right side of the sleeve is put to the right side of the garment, and the seam of the sleeve touches the seam of the garment. It will be remembered that the straight part constitutes the upper part of the sleeve, that which is on the cross falling to the underneath part of the arm. (It is to be hoped the worker has not fallen into the mistake constantly recurring of making up *two right hand* or *two left hand* sleeves.) The raw edges of sleeve, garment and binders are now parallel with each other. The raw edges of *garment* and *sleeve* must be run and back-stitched together. Turn the sleeve inside out, when it will be seen that the raw edges just run together will fall *under* the binders, which must be turned down and hemmed over them. Now it will be seen why in a previous paper it was particularly mentioned that both in putting on the yoke and in putting the shoulders together, a little open space must be left near the armhole to allow the sleeve to be properly inserted.

How to put in a Sleeve with gathers.—It can of course be easily reckoned how much of the sleeve has to be gathered; it depends upon the relative sizes of sleeve and armhole. The *position* of the gathers is at the top of the shoulder. The sleeve must first be gathered and stroked, the plain part of the sleeve is then fixed and put in exactly in the same manner as described above, with the exception that the gathered part is not touched. When the plain part of the sleeve is put in, the gathers are let out to the required length, and set in to the garment, first on the right side and then on the wrong.

This completes the shirt.

Having now gone through the method of cutting out and putting together the various parts of a chemise and

plain nightshirt, we will go on to the next exercise required from First Year Pupil-Teachers, *i.e.*,

How to mend a hole correctly in stocking material.

The best material on which to work the necessary darn is the stocking-web material sold by the piece, and which can be procured (among other places) at Cox and Co., New Oxford Street. It is not expensive, and is even in texture, which makes the darn easier to work. A pretty coloured mending thread should be used for the darn itself, of the same thickness, or a trifle finer than the thread of the material on which the darn is to be worked.

The first thing to be considered is the best way of making the hole which is to be afterwards mended. One way is to cut two or three threads, and put the finger through, working about the hole thus made, till a fair-sized one is formed. This produces rather a jagged hole with what are called 'ladders.' These must be picked up, and the hole drawn together with cotton on the right side, preparatory to darning. This is one method of making the hole. Another is to cut out a moderate sized hole in the stocking-web, picking out the little fluffy ends out of the loops, until the latter are sound and clear. For an examination darn, perhaps the latter method is the best, as it produces a good clear darn. The hole being then made and prepared for working the darn, we will pause for a moment while we briefly go through the chief points to be considered in doing so:—

(1) The size of the darn must depend on the size of the hole. This very simple rule is not often observed, very large darns being constantly made to mend a comparatively small hole.

(2) The darn is worked on the *wrong* side of the material.

(3) It should be commenced on the left-hand side of the hole in a suitable place, so that the crossing of the darn may cover properly the top, bottom and sides of the hole.

(4) The darn should not be straight, as in that case the weight of the darn being on the same thread would cause the material to break away. A diamond shape is suitable.

(5) When finished, the hole should be exactly in the centre of the darn.

(6) The needle, when making the first row of darning, should always point upwards, and downwards for the second row.

(7) Loops must be left at the end of each line of darning.

(8) The work should be held stretched over the first and second fingers, which are held a little apart.

(9) It must be carefully noted that knitted or woven materials are composed of interlaced loops, which point up and down. When the needle is going up, it will pick up those loops which point up, and, on coming down, *vice versâ*.

(10) The loops at the hole will be found to fall out, as it were, on to the right side of the material. They need not be drawn together with cotton before darning; in fact, it is better not to do so, so as to ensure the darning needle passing through them. These loops do not face each other, so that the needle cannot take up a loop pointing up and one pointing down at the same time. This is sometimes done, and the darn gets twisted in consequence. Great care must however be taken to pick up each loop at the hole, as the strength of the darn depends greatly upon this, also to darn the sides of the hole securely; the neglect of these two points causes many failures in this exercise.

Figs. 37 and 38 represent the web stretched, so as to allow the formation of the loops to be plainly seen.

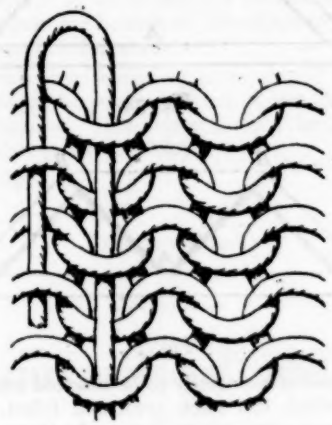

Fig. 37. (Method No. I.)

Fig. 37 shows two rows of darning. It will be noted that in the second row the needle has taken up the down loops on a different line from those picked up in the first row.

Fig. 38 shows the second row of darning worked on a line with the first.

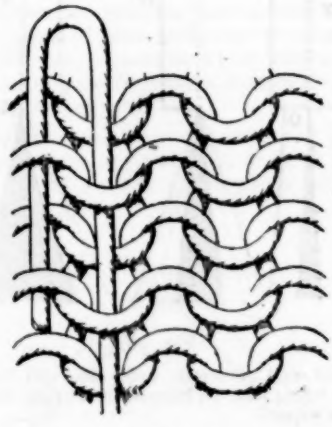

Fig. 38. (Method No. II.)

Both methods are employed, but No. I. is preferable. It is easier to cross, and more practical, as knitted or woven garments generally begin to wear thin in horizontal lines. In Method No. I. more of the garment is strengthened than in Method No. II. It is true that on carefully examining the web it will be seen that in the method advised the loops taken up in the second row of darning are formed of the same threads as the loops in

the first row; but even taking this into consideration, the first method is far better than the second one, and is the one generally employed.

In crossing, the darning cotton only should be taken up on the needle until the hole is reached, when a good lattice work darn should be made.

When the darn is completed, the square of stocking-web material should be carefully bound round, and the name, &c., of the worker written clearly on a ticket, and neatly sewn on to the specimen.

(*To be continued.*)

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IN THE BABIES' ROOM: WHAT TO DO, AND HOW TO DO IT.

BY J. W. WARREN.

Inspectress of Infant Schools, Leicester School Board.

I INTEND this month to address myself to the teacher whose lot it is to be placed in a large class of babies for perhaps the first time. The mind must first of all be disabused of the idea that any great apparent results can be gained. A teacher must enter upon her work with the greatest humility. She must first of all aim at giving ease and happiness to every little one under her charge. And to attain any thing like success, she must first consider carefully what a mother does with her young child at home. I mean, of course, a real mother. More than *she* does is not wanted. Indeed, few teachers in this class succeed in doing so much. A mother attends to the child's temporal wants, because by doing so she gives ease and happiness to her child. Some things necessary, are in themselves not always pleasant, but every office necessary is dignified by the circumstances. Children so young rely solely upon the sympathy of the nurse or mother, and the teacher, if she honours her profession, will render this mother-help in a willing and loving way. Every child may be won over sooner or later by a teacher, if she will only bear this in mind, and no amount of interesting employment will make up for such discomfort.

Our Babies' room will show then: Attention to the actual wants of the children, such as taking on and off the clothing. Babies allowed to stand tugging at strings and buttons in a cloak room experience a sense of loss that no clever teaching can dispel. A teacher should see to this, and try to find out those who need more *loving up* and notice than others. The poorer and weaker should not only be helped, but fondled and kissed and made to feel *wanted*. Some bright happy mites can be let off with a smile of welcome, but *more is wanted in many cases*. Let a teacher who has not thought this a part of her duty try it for a week; she will never give it up. And let those who feel inclined to think I am writing twaddle, ask a real mother what she thinks of this for a start. Secondly, for I must not dwell too long on these points,

Amusement must be provided for the new babies—and plenty of it—bats and balls, carts to draw, shuttlecocks, rag dolls, all and every thing that a child can enjoy. Never mind that in the natural baby fashion one toy after another is thrown away; pick them up, and play with them yourself, let others help. It is worth while to conquer by love every one of these little suffering ones. Remember, the grief is very real, and it is just this that at first forms the cross, one has to bear in this class; besides, I do not hesitate to say it is an actual duty and stands where it is needed before all erudition. Thirdly (and I enter upon this point without any reserve, as it is another essential),

Careful and constant attention is needed with some babies to ensure cleanly habits. Accidents rarely happen in a well-appointed nursery, and should as rarely occur in a good babies' room. A clever teacher will make each little one quite comfortable, doing for the child what a good mother would not hesitate to do. Every young teacher should train herself to it, thinking of it only as part of her great and glorious plan of education. Froebel himself performed the meanest offices for his pupils; we aim at following him in every thing we do. The children of the poor need much moral training, and untold good comes of beginning so early. It has been my lot often to see a Head Mistress do things that she 'didn't like to ask a teacher to do.' But why not? I should like to say, Young teachers, try to imagine yourselves at the head of the school for once, and stoop to do all that you feel needful for the physical comfort of your pupil. You are to train, not only to teach. Training includes so much that you cannot get outside it at all. Therefore you have no excuse in leaving any thing undone.

With these hints I will now hope that enough has been said for teachers to endeavour to put into practice all the suggestions as a preliminary step to a perfectly well trained class. No excellent school undervalues these simple necessary duties. Disgrace need only be felt when selfish disinclination and absurd pride cause a teacher to disregard them. I shall have something more to say about the fittings of the room, but I am aware that I write unfortunately for those who have little or no control over this, and my object is to help in the greatest need.

I believe that one of the first questions put by a teacher when first put with the babies, is, 'What shall I do with them?' and naturally, for they cannot read, write, nor work sums, and therefore the main ground is cut from under the feet of the ordinary teacher, and there are many such.

We will answer the question by advancing a suggestion.

All instruction should take the form of amusing occupation.

Do not begin by trying to teach, and you will end by doing it. Make a list of all the occupations you know something about, and keep on learning more of these; properly arrange, make a time table—no reading, no writing, no arithmetic, at least so-called—but find in your occupations the germs of all real elementary instruction, *Form*, *Sound*, *Number*, *Colour*, and so arrange your occupations that you give the fair and necessary amount of time to each one of these fundamental elements, as you will have learned how to do in other class work. Add to these occupations *Games*, play unrestricted, and music, and you have as complete a course of instruction as any learned pedagogue can devise. I have suggested to teachers such a list as the following as suitable, and will explain as well as I can, how each may be done, and what each teaches.

List of suitable occupations for a babies room:—

1. Play with twist, threads, or chains.
2. Pictures, and stories from them.
3. Round games for various work.
4. Games at shopping.
5. Ball making.
6. „ bouncing.
7. Hide and seek, with various material.
8. Bean or shell placing.
9. Play with dry sand.
10. Beads (large) for number.
11. „ „ colour.
12. „ „ sound.
13. Wet sand for moulding.
14. Clay for modelling.
15. Stories told with subjects placed.
16. Stories heard from children.
17. Games with giant letter cards.
18. Local events.
19. Straws threaded.
20. Sorting games, shape.
21. „ „ for position.
22. „ „ „ colour.
23. „ „ „ size.
24. „ „ „ material.
25. „ „ „ form.
26. „ „ „ bulk, weight.
27. Simple separation of elements.
28. Stick laying.
29. Tablet placing.
30. Flowers.
31. Fraying and making-up.
32. Fish pond game.
33. Gift I. Froebel.
34. „ II. „
35. „ III. „

There are a great many other plays quite as good, but I am anxious to list only those I am prepared to explain fully. Those given are not put in any regular order; but in the Model Time Table, that will be given in a later paper, an endeavour will be made to arrange a working syllabus. I should like to urge upon a teacher to try some simple occupation, and not to wait until she has more at command. The cut-and-dry way of conducting a babies' room has utterly failed, and something quite different is wanted. Next month I shall explain one of the most useful occupations, *Sorting* (Nos. 20 to 27), as I believe that these can be readily taken up from such explanations as I am able to give here.

(*To be continued.*)

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THE METHOD OF ART STUDY.

BY ERNEST RADFORD.

(CONTINUED FROM PAGE 70.)

My readers, some at least, will remember that our first talk about Art was occupied in the endeavour to define it; in short to find out what it was. 'Art' we agreed, was 'skill spent upon a visible substance so that its product has primarily an æsthetic significance.' Now having defined our subject in words which give it something of the compactness and the rotundity of a hedgehog, the question next to be considered is how best to approach it, and where to lay hold. For 'Art,' for all our efforts to squeeze it down, remains an immense thing. The ground of it is scarcely covered by its many professors. If I can do something towards an intelligent arrangement of its matter I will leave its detail to them. One shall lecture to you upon Archaic Sculpture—12 lectures for that. One on the Age of Pheidias—12 surely for that. 'On the heels of Alexander'—here again is a title very suggestive of lectures upon the decadence of Greek Art. Passing through the 'dark ages,' called 'dark' only because our light has gone out, we shall find ourselves tracing Art's doings in Italy. And here I must leave you to the army of lean æsthetes who wait to escort you in that land and explain to you in ways peculiar to themselves how straight is the gate from Giotto to Raphael. You must read Ruskin, and then as a corrective John Addington Symonds. You must travel; you must haunt the galleries at home and abroad. If it can be managed without inconvenience you must change your religion. You must put yourself on a special diet attenuated to the point of starvation; you must roll your eye and comb all truant curls from your hair; you must wear a smock and girdle, and attend art lectures by the fifty score before you can consider you have made more than a beginning of this great, though narrow, study. If you would travel all this ground you must do it without my company. My only wish is to give you my blessing at the start, and to simplify your path by some hints as to the secret of its windings. I wish my readers to know that I make no claim to a specialist's knowledge, even upon the ground covered by my writings. The teaching of a University much enlightened my mind as to methods of study, but of actual knowledge it gave me nought. Like a truant boy I passed some high gates, and trespassed a little way into fair secluded gardens, but gardens are not for me whose course is barefoot on life's way. Later on, if you follow so far, I will bring you to the gates of this garden and show you the way in and the way out with a sketch map of its winding paths.

I have hinted at the immense field open to the student of Italian Art in its various ages, schools, and applications. Let us turn for a moment to the Art of Holland. By comparison with the Italian it presents a subject whose lesson is in its simplicity. Even here if you fall a prey to the professors of art, and to those creatures called connoisseurs, and still worse to the mindless men who only know art as 'collectors' you have a subject that may occupy your lives. The connoisseur is not a critic in the largest sense, and the final results of connoisseurship only supply *data* for the beginnings of criticism. Once I was deluded into sitting through twelve lectures on Rembrandt (grand old man as he was) by a paid professor. At the end of the course I believe I knew about ten times as much about Rembrandt as anyone wants to know, all about his forerunners who didn't influence him at all, and all about his followers who couldn't keep up with him. I knew all about his canvas and his copper, and if anyone wants to know about 'etching' I can tell him shortly that the last state of that plate is worse than the first. I speak to students not to specialists. I think the lives of bright young men devoted to billiards are not more wasted than those of many so-called specialists in art. Taking these

two instances of art in Italy and in Holland, I have tried to suggest shortly that the subject of art, if you wish to master it like a bibliac or a cataloguer, presents material for about a billion books, and for lectures from Dan to Beersheba. Something has taught me that there is a quicker way than this into the secret of beautiful things. I shall confine myself to generalities, and only enter art's gardens like a truant, to take a general survey and perhaps to steal a flower.

When I was young I was taught History. Considering that we write it with a capital H, it is wonderful how little ground that HISTORY covered. It was after all only English History because no other was recognised by the lions that guard the gates of the London matriculation. Also these studies were abruptly stopped at the accession of William III. I was told that there had been no History since. So the common report that Queen Anne is dead is no solid fact to me but merely a floating rumour. I know now that History is incessant and cannot be stopped by any arrangement between the demon of exams. and the proprietors of private schools. It is something to have escaped such chains and to have learned of History even so much. The proper subject of my paper to-day should be Art and History, or the contribution of Art to sociological study; or shortly, my debt to Herbert Spencer. I have called it however the 'Method of Art Study,' and it becomes my business to exhibit that method and to show into what large and simple lines the subject falls. What seemed detailed beyond apprehension, and complicated beyond analysis, shall appear all ordered in its masses and ready for a student's attack. I am conscious that I must use hard words which are hardly within the vocabulary of the masters of that Pigeon-English which serves for Art-criticism. 'Elegancy' must be sacrificed where accuracy is at stake.

Mr. Gladstone was fond of saying in any emergency that 'three courses were open to us' and *Punch* of that date suggested 'the door, the window, and the chimney, and the last as most likely to soot him.' I am afraid I share Mr. Gladstone's weakness, for I find three distinct approaches to the subject of Art along any one of which the walk of a lifetime might be made. I can do no more now than indicate these courses and speak of them further in later papers. Art in its most obvious aspect presents matter to students of History. It is theirs to consider—

(1) *How the character of Art work is conditioned, or distinguished, by the social environment of the age that produced it, or Art as the product of thought and event.*

These words are shaped to include the record of Art in the survey of sociology. If I were talking to children I would say, 'History, my children, is not the dull concoction of dates and dynasties that you have thought it to be. History is indeed a picture book and has been illustrated by great workers whose testimony is irrefutable. Let us skip for to-day the wearisome pages of print and look only at the pictures. It is the office of thought to unite what it is the business of bookmakers to separate, and we in our progress shall be concerned rather with the links which unite one period of achievement with another, than in widening the gaps between them.

A way of looking at Art that changes the ground altogether and opens up great fields for thought and enquiry, and calls for every faculty of the mind is this: having completed our historical researches we find a new subject in considering how—

(2) *The character of Art work is conditioned or distinguished by the material in which the work is done.* In every material there is some quality which asserts itself and dictates to the worker the tools which shall be used upon it. In this assertion of the material the artist finds his limits and his opportunities. He must not transcend the limits set by its laws. It is his business to discover within set limits, what opportunities are special to the material. As Lovelace sang

> Stone walls do not a prison make,
> Nor iron bars a cage.

So must an artist find his opportunities in his limitations; so must the singer in his prison, so must the dancer who would exhibit all the graces of restraint. So by this law of the material as we may call it, every Art has its own special powers within its accepted limits. The same Historic conditions may excite a Sculptor to his greatest effort, and a painter to his best. Both perhaps are the servants of one religion or the devotees of one ideal. But sculptor and painter, though they may have one thought to express, are widely divided from one another by the opportunities which their several crafts afford. This line of study can be indefinitely extended and it is essential to the idea of an education that it should be. We shall then talk of the range of the sculptor, his great opportunities and his narrow limits; then of the painter with his larger power of dealing with sheer emotion, and with life in crowded detail. Admitting the poet to the society of artists we find that he is a craftsman too, who finds in words revelations that are not for painter or sculptor. Here we speak under the influence of Lessing who wrote of the separate spheres of the poet and the sculptor in his famous contrast of the Laocoon of the sculptured group and the Laocoon of Virgil's song. Art cannot depict without exaggeration of its proper powers, the fact of Jonah in the whale; therefore the artist is precluded from depicting the climax of the narrative. The artist of words is ahead of him there. Lessing's work goes further than he foresaw perhaps, for it really gives us a rule for the understanding of all the Arts. People talk loosely about 'engraving.' If they would arrive at an intelligent understanding of it, they should pursue this line of thought that Lessing awakened—seeking the special opportunities of the medium. Among engravings they will begin to understand how limitation discovers opportunity to the engraver in line—the mezzotinter—the etcher, and so forth, and all true decorative art, I may add, depends for its effect upon a clear understanding at once of the limits set by the material and the opportunities it offers. In this way of thought there is an education worth acquiring. In the pursuit of it we cover much ground, and employ in a splendid exercise every power of the mind upon the deepest revelation of feeling.

I spoke of the decorative Arts and how they live under this law of the material. I must be allowed to speak of them again, because in considering these decorative or ancillary arts we have a special subject and have to deal with arts exercised subject to considerations which do not hamper the sculptor in the round, or the painter of pictures for a frame.

Here then is my third and last division of the great subject of Art—

(3) *The character of Art work as conditioned or distinguished by the material.*

As to this I will only say to-day that Bentham invented a useful phrase which becomes luminous if applied analogously to our subject. 'Physical sanction' is the phrase. Now *sanction* means punishment, not permission, and *sanction* is essential to the idea of law as distinguished from mere moral habit sustained by public opinion. The words 'physical sanction' he invented to stamp the idea of deserved punishment upon the body for its own excesses. A man reaps in the sufferings of the morning the reward of his nocturnal excesses. In other ways the body has its *own* laws which are 'sanctioned,' that is they cannot be broken with impunity. In the same way every material lays its law and its limits upon the worker. If he has sense to see these laws and obey them he may win the distinction of an artist, if he transcend those limits he will expose the inaptitudes of his material, in the attempt to show its range and may suffer the punishment of the drunken man who in his way has exceeded his limits. So the phrase 'physical sanction' as Bentham applied it, may be used very luminously I think, in speaking of the various materials of the Arts and the laws which they lay on those who use them.

(To be continued.)

LA JEUNE SIBÉRIENNE.

TRANSLATED BY PROFESSOR DARQUÉ.

(Author of 'Pupil-Teachers' French Course.')

La Jeune Sibérienne.

Depuis lors trois ans s'écoulèrent sans que Prascovie osât[79] renouveler ses instances à ce sujet. Une longue maladie de sa mère la contraignit de renvoyer[80] son projet à des temps plus favorables ; cependant, il[81] ne se passa pas un seul jour sans qu'elle joignît à ses prières ordinaires celle d'obtenir de son père la permission de partir, bien persuadée que Dieu l'exaucerait un jour.

Cet esprit religieux, cette foi vive dans une si jeune personne, doivent paraître d'autant plus extraordinaires, qu'elle ne les devait point à l'éducation. Sans être irréligieux, son père s'occupait peu de prières ; et, quoique sa mère fût plus exacte à cet égard,[82] elle manquait, en général, d'instruction,[83] et Prascovie ne[84] devait qu'à elle-même les sentiments qui l'animaient. Pendant ces trois dernières années, sa raison s'était formée ; déjà la jeune fille avait acquis plus de poids dans les conseils de la famille : elle put, en conséquence, proposer et discuter son projet, que ses parents ne regardaient plus comme un enfantillage, mais qu'ils combattirent avec d'autant plus de force qu'elle leur était devenue plus nécessaire. Les empêchements qu'ils mettaient[85] à son départ étaient de nature à faire impression sur son cœur. Ce n'était plus par des plaisanteries ou par des menaces qu'ils tâchaient de la dissuader, mais par des caresses et des larmes. 'Nous sommes déjà vieux, lui disaient-ils, nous n'avons plus ni fortune ni amis en Russie : aurais-tu le courage d'abandonner dans ce désert des parents dont tu es l'unique consolation,[86] et cela pour entreprendre seule un voyage périlleux, qui peut te conduire à ta perte et leur coûter la vie,[87] au lieu de leur procurer la liberté ?' A ces raisons Prascovie ne répondait que par des larmes ; mais sa volonté n'était point ébranlée, et chaque jour l'affermissait dans sa résolution.

The Young Siberian.

Since that time three years passed away without Prascovie daring to renew her entreaties on that subject. A long illness of her mother's compelled her to put off her project till a more favourable time ; yet not a single day passed without her adding to her usual prayers that of obtaining from her father the permission to set out, *as she was* quite persuaded that God would some day hear her prayers.

That religious turn of mind, that lively faith in so young a person, must appear so much the more extraordinary because she did not owe them to education. Without being ungodly, her father thought little of prayers ; and, though her mother was more regular in that respect, she was generally wanting in education, and Prascovie was only indebted to herself for the sentiments that actuated her. During those three years her reasoning powers had been formed ; already the young girl had acquired more weight in the affairs of the family ; she was consequently able to propound and discuss her project, which her parents no longer looked upon as childish talk, but which they opposed so much the more energetically that it had become the more needful. The impediments which they raised against her departure were calculated to make *a deep* impression on her heart. It was no longer by quizzing or threats that they endeavoured to dissuade her, but by caresses and tears. 'We are already old,' they would say to her, 'we no longer have either fortune or friends in Russia : could you have the heart to forsake in this desert parents whose only comfort you are, and that *too* to undertake alone a dangerous journey, which may lead to your ruin and cost them their lives, instead of procuring them their liberty?' To those reasons Prascovie only opposed her tears ; but her will was not shaken, and every day strengthened her in her resolution.

Notes.

(79) The subjunctive invariably follows *sans que*, which always conveys an idea of doubt.

(80) *Renvoyer*, literally, 'to send back.'

(81) The impersonal form of the verb with the real subject placed after it is frequently met with : *il arrive beaucoup d'accidents par mégarde*, there happen many accidents through neglect, *i.e.*, *beaucoup d'accidents arrivent par mégarde*, many accidents happen through neglect.

(82) *Avoir des égards pour quelqu'un*, to show deference towards some one ; *à l'égard de*, as for.

(83) *Instruction* would, perhaps, be best rendered here by 'learning,' that is to say, what is usually taught in schools.

(84) Whenever *ne* precedes any verb other than *cesser*, *oser*, *pouvoir*, and *savoir*, meaning 'to be able,' students should ascertain what is the word with which it is used. *Ne...que* stands for *seulement*, but, only.

(85) *Mettre* used with words expressive of time is generally translated by 'to take' : *j'ai mis une heure à faire cela*, it took me one hour to do that.

(86) The predicate of a sentence, if expressed by a noun, never precedes the verb, as it often does in English. If, however, an adjective happen to be the predicate it will occasionally change places with the subject : *heureux sont les gens qui*, etc., happy are the people who, etc.

(87) Notice : *ils ont perdu la vie*, they lost their lives. In expressions of that kind the French invariably put the noun in the singular.

Il se présentait[88] une difficulté d'une autre nature, et plus réelle encore que l'opposition de son père : elle ne pouvait partir qu'avec un passe-port, sans lequel il ne lui était pas même possible de s'éloigner du village. D'autre part, il n'était guère[89] probable que le gouverneur de Tobolsk, qui n'avait jamais répondu à leurs lettres, consentît à leur accorder cette faveur. Prascovie fut donc forcée de remettre[90] son départ à un autre temps, et toutes ses idées se portèrent[91] sur les moyens d'obtenir un passe-port.

Il y avait alors dans le village un prisonnier nommé Neiler, né en Russie et fils[92] d'un tailleur allemand. Cet homme avait été pendant quelque temps domestique[93] d'un étudiant à l'université de Moscou, et il avait tiré de cette circonstance l'avantage de passer pour un esprit fort[94] à Ischim. Neiler s'imaginait être un incrédule. Cette espèce de folie, jointe au métier plus utile de tailleur qu'il possédait,[95] l'avait fait connaître[96] des habitants et des prisonniers, dont[97] es uns lui[98] faisaient raccommoder leurs habits, et dont les autres s'amusaient de ses impertinences. Au nombre de ces derniers était Lopouloff, chez lequel il venait quelquefois. Neiler, connaissant l'esprit religieux de la jeune personne, la persiflait au sujet de sa dévotion, et l'appelait Sainte-Prascovie. Celle-ci, le croyant plus habile qu'il n'était,[99] projetait de s'adresser à lui pour en obtenir la supplique qu'elle voulait adresser au gouverneur, dans l'espoir que son père, n'ayant plus[100] qu'à la signer, s'y déciderait plus facilement.

Elle venait[101] un jour d'achever son blanchissage à la rivière, et se disposait à retourner au logis.[102] Avant de partir, elle fit, à son ordinaire, plusieurs signes de croix, et se chargea[103] péniblement de son linge mouillé. Neiler, qui passait par hasard, la vit et se moqua[104] d'elle. 'Si vous aviez, lui dit-il, fait quelques-unes de ces simagrées de plus, vous auriez opéré un miracle, et votre linge serait[105] allé tout seul[106] à la maison. Donnez, ajouta-t-il en s'emparant de force du fardeau, je vous ferai voir que les incrédules, que vous haïssez si fort, sont aussi de bonnes gens.' Il prit, en effet, la corbeille et la porta jusqu'au village. Chemin faisant, Prascovie, qui n'avait qu'un désir, celui d'obtenir un passeport, lui parla de la supplique et du service important qu'elle attendait de lui. Malheureusement, le philosophe ne savait pas écrire : il avoua que depuis l'instant où il s'était voué[107] à l'état de tailleur il avait négligé la littérature ; mais il indiqua dans le village un homme qui pourrait remplir son attente. Prascovie revint toute joyeuse, se proposant de mettre à profit[108] ce conseil dès le lendemain. En rentrant chez son père, où se trouvaient quelques personnes, Neiler se vanta hautement du service qu'il avait rendu à sainte Prascovie, en lui épargnant la peine de faire un miracle, et fit d'autres mauvaises plaisanteries de ce genre ; mais il fut bientôt déconcerté par la réponse de la jeune fille. 'Com-

There arose a difficulty of another kind, and a still more real one than her father's opposition : she could start only with a passport, without which it was not even possible for her to leave the village. On the other hand, it was hardly probable that the governor of Tobolsk, who had never answered their letters, would consent to grant them that favour. Prascovie was, therefore, compelled to postpone her departure till another time, and all her thoughts were concentrated on the means of getting a passport. .

There was then in the village a prisoner of the name of Neiler, a native of Russia and the son of a German tailor. That man had been for some time the servant of a student at the university of Moscow, and he had derived from that circumstance the advantage of being looked upon as a freethinker at Ischim. Neiler fancied he was an unbeliever. That kind of madness coupled with the more useful trade of tailor which he carried on, had made him known to the inhabitants and prisoners, some of whom made him mend their clothes, and the others laughed at his nonsense. Among the latter was Lopouloff, at whose house he sometimes called. Neiler, aware of the religious disposition of the young person, jeered at her on account of her piety, and called her Saint Prascovie. The latter, believing him *to be* more clever than he was, intended applying to him to obtain from him the petition she wanted to send to the governor, in order that her father, having no longer ***anything*** more *to do* but to sign it, would more easily make up his mind to do so.

She had one day just finished her washing at the river, and was making ready to return home. Before starting she, as usual, crossed herself several times, and with difficulty took up her load of wet linen. Neiler, who chanced to be going by, saw her and laughed at her. 'If you had,' he said to her, 'made a few more of those grimaces you would have wrought a miracle, and your linen would have gone all alone to your house. Give *it me*,' he added, forcibly seizing the burden, 'I will show you that unbelievers, whom you hate so much, are also good people.' Indeed, he took the basket and carried it to the village. On the way, Prascovie, who had but one wish, that of getting a passport, spoke to him of the petition and the important service she expected of him. Unfortunately, the philosopher could not write : he confessed that from the moment that he had taken to the trade of a tailor he had neglected literature, but he pointed out in the village a man who could fill her expectation. Prascovie returned *home* quite joyful, intending to avail herself of that advice the very next day. On his return to her father's, where a few persons were present, Neiler boasted loudly of the good turn he had done to St. Prascovie, by saving her the trouble to work a miracle, and indulged in other sorry pleasantry of that kind ; but he was soon disconcerted by the answer of the young girl. 'How could I,' she said

(88) Here is another instance of the use of the impersonal form of the verb instead of the regular construction (*une difficulté d'une autre nature...se présentait*) on account of the length of the subject.

(89) *Ne...guère*, literally, 'not much.'

(90) *Remettre* has so many figurative meanings that beginners will do well to consult a good dictionary whenever any doubt arises. Here it may also be rendered by 'to put off.'

(91) *Se portèrent sur* might here be more accurately translated by 'were directed towards.'

(92) The absence of the article before *fils* would seem to imply that Neiler had, at least, one brother.

(93) The article is unnecessary before *domestique*, because that noun is here used adjectively.

(94) *Esprit fort*, when used in reference to woman, only means 'strong-minded.'

(95) *Possédait*, literally, 'had' or 'possessed.'

(96) Here is another example of a French infinitive rendered by an English past participle.

(97) *Dont* cannot be separated from its antecedent, though its English equivalent may be.

(98) This peculiar mode of expression has already been pointed out.

(99) *Ne* is absolutely necessary before *était*, because Neiler was *not* so clever as Prascovie thought he was.

(100) *Ne...plus*, no longer ; *ne...que*, but. One of the *ne*'s must be here understood.

(101) *Venir d'achever*, to have just finished ; literally, 'to come from finishing.'

(102) *Logis* has here the same meaning as *maison*, and might elegantly be replaced by it.

(103) *Se chargea*, literally, 'loaded herself.'

(104) *Moquer*, to mimic.

(105) A few intransitive verbs have their compound tenses formed with the auxiliary *être*, such are :

aller, to go	*parvenir*, to succeed
arriver, to arrive	*revenir*, to come back
choir / *tomber*, to fall	*survenir*, to supervene
venir, to come	*décéder* / *mourir*, to die
devenir, to become	*naître*, to be born
intervenir, to intervene	*partir*, to set out
	etc.

(106) *Tout seul* may here be rendered by 'of its own accord.'

(107) *S'était voué*. Literally, 'had devoted himself.'

(108) *Mettre à profit*, to turn to account.

ment pourrais-je, lui dit-elle, ne pas mettre tout ma confiance dans la bonté de Dieu? Je ne l'ai prié qu'un instant au bord de la rivière, et si mon linge n'est pas venu[109] seul, il est du moins[110] venu sans moi, et porté par un incrédule. Ainsi le miracle a eu lieu, et je n'en demande pas d'autre à la Providence.' A cette réponse, toute la société se mit à rire aux dépens du tailleur, qui se retira très-piqué[111] de l'aventure. On verra dans la suite plusieurs exemples de cette aimable présence d'esprit, qui n'abandonna jamais la jeune fille dans les circonstances les plus embarrassantes.

to him, 'not put my whole trust in God's goodness? I prayed to him only for a moment by the river side, and if my linen has not come alone, it has come at least without me, and *was* carried by an unbeliever. So the miracle has taken place, and I do not ask any other of Providence.' At that answer the whole company burst out laughing at the expense of the tailor, who withdrew greatly vexed at the adventure. We shall see further on several instances of this lovely presence of mind, which never forsook the young girl in the most trying circumstances.

(To be continued.)

([109])See note ([102]) on page 195.

([110])*Du moins* implies a restriction on the previous statement; *au moins* points out the least quantity: *toute la ville y était, du moins on me l'a dit*, the whole town was there, at least I was told so. *Prêtez-moi au moins trois livres sterling*, lend me at least £3.

([111])*Piquer*, to prick, to goad.

DAPHNE'S DARING.

BY MRS. A. PHILLIPS.

Author of 'Man Proposes,' 'Benedicta,' 'By the Cards,' &c.

CHAPTER VIII.

'This life, sae far's I understand,
Is a' enchanted fairy land.'

AT the breakfast Mr. Grey had not much opportunity of speaking to Daphne. Effie Maitland kept guard over him. It was only by accident he got free of her. Mr. Wilson's friendly foot trod on Effie's dress, and 'dragged it from the gathers.'

'How tiresome!' she exclaimed, but it is an ill wind that blows no one any good. Effie had to run upstairs, and while she was gone Mr. Grey came over to Daphne.

'I want you to give me the last dance before supper to-night,' he whispered. 'I have a reason for not asking you for more. Will you keep that one for me?'

'As a reward for neglecting me for the previous part of the evening,' she said, with a laugh, looking up into his face. 'It is too bad to ask me when I shall be almost too tired to dance.'

'Perhaps that is my reason. I want to talk to you instead. Do you understand?'

'Very well,' she said, not daring to lift her eyes to him now. She felt what he meant, and the consciousness was heavenly.

There was no time for more words between them. Effie's 'gathers' had been restored to their proper place, and his tyrant was there to claim him.

He was so absent during breakfast that when it was nearly ended his tormentor began.

'I am afraid Mr. Grey is in love,' she called, half aloud, to Miss Lotty across the table—sitting opposite.

'Miss Maitland must take the responsibility of having produced what she charges me with,' said Mr. Grey, leisurely and ironically. 'In which case she ought to be more merciful to my silence than she seems disposed to be.'

'Now, Mr. Grey, you are too bad,' said Effie, simulating wounded feelings. 'I can see further than you think. It is unkind of you to be so spiteful.'

Seeing that his remark had really offended her, he made amends, saying in an apologetic manner,

'Indeed, Miss Maitland, I know you are to be pitied to have had such an infliction as myself for a groomsman. Pray forgive me. I know I am stupid.'

'You were anything but "stupid," as you are pleased to term yourself, the first evening I met you. I thought then ——; but never mind what I thought,' she said, interrupting herself, with a show of confusion; adding, 'I have no doubt it is a matter of the most perfect indifference to you what I think.'

'There you are mistaken. I don't think any man is indifferent to the opinion of a lady—or at least he ought not to be. No doubt I may have given you that impression, because I feel I am almost a savage after my many years' absence.'

'In that case you must let us teach you how to grow civilized. To begin with, here is some wedding cake,' she said, taking some and giving him a piece.

'You put it under your pillow and dream on it, don't you? I think I remember hearing that that was the orthodox thing to do with this sort of stuff.'

'Oh, yes; I mean to try and dream on mine. Suppose, now, I were to dream of you—wouldn't it be unfortunate, considering how much you dislike me, and how little you try to conceal it.'

'Come, that is making too rash a statement,' he said. 'Don't draw on your imagination, or I shall think that you are given to dreaming without the stimulant of cake.'

'Of course, if you say so, I must believe you.'

'Good! and as an earnest of your good faith, mind you keep me a couple of dances this evening.'

'Only two,' she thought; while aloud she said, 'With pleasure. I'll not forget.'

'What a very odd girl!' he thought, when he was alone. 'She is dangerous. I should not like to trust her further than I could see her, as I am sure she could play an unscrupulous part if things did not go to her liking.'

. . . . . .

The evening came at last which was to decide his fate.

Daphne had rested during the afternoon, having refused all invitations to join the party that went driving. She was glad to get away from the attentions of her groomsman, 'Captain' Glossop—as he insisted upon being called, in virtue of his Volunteer rank. His insufferable conceit had wearied her out. He could not enter a room, or sustain five minutes' conversation without seeking for his reflection in any mirror the room might contain.

'Quite an ornament to society,' said Miss Lotty to James, with a twinkle in her eye, as she saw him gyrating round the room in a valse with Daphne. 'I declare Cartown is quite blossoming with eligibles. I like our new man, Mr. Grey, very much.'

'Umph!' said James, doubtfully. 'Not a bad fellow on the surface. I wish we knew more about him, for between us, Miss Lotty,' he said, drawing his chair a little closer, in order to whisper the more confidentially in her ear, 'between ourselves, I think Daphne is rather touched in that quarter,

and I am beginning to feel a bit anxious. If I mistake not, the "ornament to society," as you call him—"Captain" Glossop—could tell us something about him. He spoke as if he knew him.'

'I should be glad if you would find out if he is "all right,"' said Miss Lotty, anxiously, 'for I am of your opinion about our Daphne.'

'I will—I'll take the first opportunity of sounding him.'

'Do—I declare you've made me feel nervous, James, about the child—bless her! How sweet she is looking to-night, and how happy! God forbid she should come to sorrow!' exclaimed Miss Lotty, as another and another round in the waltz brought Daphne and her partner in full view.

'Amen,' said James, more than ever determined to sound the "Captain," who was now taking Daphne to sit down in the conservatory, which led out of the back drawing-room. They remained chatting there until the next dance, when Charley Morris came up and claimed his dance.

'I don't think I shall move,' thought the Captain, as he glanced down his card, and found he had no partner for the dance. 'I must recruit after my late exertions. What a deuced nice little girl that was!—must book her for another—'

'What! you alone, Captain Glossop,' said James, interrupting these meditations. He had watched his opportunity like a true man of business.

'Yes; it is warm work. My shirt-collar won't last out the evening if I am too energetic. Cool in here, is it not?'

'Yes, very. Do you make any stay in our town?'

'No; I only came for the day. I leave to-morrow. Next week I have to do best man at another wedding in London. I declare that it seems my whole duty in life is to wait on the bliss of others. By the way, who is that girl that Grey is dancing with? By Jove! he knows a fine woman when he sees her; but I have always heard that of him.'

'Oh, he is dancing with Miss Maitland just now,' said James, as he peered through the open conservatory door in search of Mr. Grey and his partner.

'You have known Mr. Grey, then, before,' he remarked.

'No; only by hearsay. Blenkins, a man in the same line as himself, visits at my mother's place, and he was speaking to me about him. He was telling me of a jolly row he got into some years ago.'

'Do you know what it was about?'

'Oh, he is one of those good-hearted, wild sort of fellows, and came a cropper at last.'

'I wish you could recollect the particulars,' said James, 'because he was an old schoolfellow of mine, and I am interested in him.'

'I am sorry I can't. Blenkins did not tell me the story very clearly, and I should not like to commit myself to a wrong statement. Blenkins has gone to Ceylon. I can write to him if you like.'

'On no account. There is no reason why you should,' said James, quickly, anxious to remove any impression that might make Captain Glossop suppose he had any more direct reason for asking.

'Oh, then, in that case, keep dark what I have said. No man likes his old scores brought up in judgment against him. I don't want to spoil sport, and he seems very jolly just now with that Miss Maitland.'

'Oh, I shall keep it dark. Ours is not a town to give any hints in.'

'What town is? Well, good-bye for the present. I am going to "liquor up."'

James was not happy at the hint that Captain Glossop had left with him about Mr. Grey. He took alarm on Daphne's account, and made up his mind to put a stop to the whole affair.

'He is not taking much notice of her this evening,' he thought, 'so perhaps there is nothing in it.'

Mr. Grey was in a preoccupied state of mind throughout the evening, as any man would be who has a proposal on his mind. He felt he had done his duty to society like a man. He had danced and talked with all the girls he had been introduced to. He thought, therefore, he might now rest on his oars, and enjoy himself, if such a word were compatible with the restless anxiety he was enduring. Daphne was still dancing. He could not claim her until the next dance. In the meantime he determined to wait and bide his opportunity. Seeing a vacant chair by Miss Lotty's side he dropped into it.

'If you feel inclined for flirtation, Miss Barton, I am at your service.'

'I like you talking to me of flirtations, considering the offer you made me this morning in the eye of the church. If I were a Scotchwoman I should feel as good as married to you, so don't think you are going to be let off so easily. But come, now, tell me! How is it such a smart young man as yourself should be reduced to talking to an old woman when the room is full of pretty girls?'

Cheery as was her manner, Miss Lotty was privately resenting Mr. Grey's neglect of Daphne. Throughout the evening he had not danced with her once.

'I am waiting for my partner, if you have no objection,' he said with a laugh.

'Who may that be?'

'You are curious,' he said, smiling.

'Yes, I should think so. As your bride-elect, who has a better right to ask? I am jealous, sir, I warn you.'

'Then perhaps you won't object to your favourite, Miss Lee.'

'It is late in the evening to shower your favours on her—the prettiest girl in the room, out and out, to my mind.'

He did not reply. He did not dare to trust himself to say what he thought of her. His mind was in a state of suppressed excitement that was painful, and he found further conversation with Miss Lotty irksome. He moved away presently, and stood waiting until Daphne should have given her partner his dismissal.

'At last!' he exclaimed. 'You are tired. I am not going to let you dance any more; you must come in here and sit down,' he said, taking her into the conservatory, which was fortunately vacant.

They sat without speaking for some time. The silence was ominous. She grew nervous. She felt what was coming as he said at last, in a low tone, while she with bent head, played with the flowers of her bouquet.

'I think you love me a little, don't you?' Her nature was so transparent, he made no pretence of ignorance.

Her heart beat violently. He took her hand. She did not know whether she ought to let it remain. The fear of 'mother and the girls' was always more or less strong upon her, giving her vague ideas of some propriety that she might be violating. But love was stronger now than all misgivings, and she let it remain.

'Why do you ask? You *know* I do,' she answered simply.

Tremblingly she raised her eyes and met the look in his face, which told her she might trust him wholly. All her fears vanished.

'Why do I ask you?' he repeated; 'because, darling, your love is the most precious thing in the world for me; and if I can only spend my life in making you happy, I shall feel blessed beyond all hope—I love you so!'

And now the hand-clasp grew warmer and more fervid as he raised her hand to his lips and covered it with kisses. He dared not do more, for at any moment they might be joined by others.

'You are my own, then, for ever?' he asked.

'For ever,' she whispered, too happy to say more.

The silence of joy—that deep solemn silence that transcends all speech, because thought is communicative, and is more eloquent than words—now fell upon them. They remained thus until the dance was nearly finished, when he said—

'I will write to your father to-morrow—or, rather, to-night, as I start for town to-morrow; but I shall be back the day after, when I shall get your father's answer. And let me have a line from you also. How am I to exist away from you for two whole days?' he asked, looking into her eyes tenderly. 'But I shall hurry through my business to come back to you.'

It was no longer prudent for them to remain where they were, as he saw Effie Maitland and her partner coming towards them, to see if the conservatory were disengaged.

Rising, he gave her his arm, and they went out into the crowd. They had touched that point of happiness that comes but once to all—when speech is superfluous, for feeling is supreme.

CHAPTER IX.

'But my true love is grown to such excess,
I cannot sum up half my sum of wealth.'

DAPHNE scarce closed her eyes that night,—or morning, one should properly say. When once more alone in her room, she sat down to the delicious enjoyment of living over again that ten minutes in the conservatory. She did it not once, but twelve times at least. She was overwhelmed with astonishment to think what 'the nicest man she had ever seen,' could find in *her*, a simple, unpretending little nobody, that he should ask her to be his wife. She had no accomplishments, and she was not very good looking; at least, with a due desire to keep pride from growing, they had never let her think so at home. She turned to her glass in simple wonderment, to ask herself what it was that had brought her such happiness that, if it were 'looks,' she might love and cherish them with friendly care for ever.

Then she thought how utterly foolish she was to be staring at herself in the glass in this manner, but she smiled at the little face that answered to her own, as she said half aloud,

'Daphne, you must be forgiven, for too much joy is making you mad. Go to bed like a good, wise girl, and thank God in your prayers for being so good to you.'

God was not the mythical incubus to her young soul that He is to so many. A pure intuitive perception had taught her that He was a great good outside of and beyond her, yet loving her and shedding love into her heart as the sun sheds light and heat into the heart of the flower.

It was characteristic of the purity of her love for the man to whom she had given her heart, that she did not stop to question if he were rich or poor, or if he possessed relations or not. He was *her* world. It was enough for her that he had asked her to be his wife, and whether her life would be fed upon dry herbs or dainties she never stopped to consider for a second.

She determined not to say a word to any one until he had written, and her father had received the letter. Then, she concluded, all would be settled without her having to announce the matter or publish her feelings on the subject to her family. Her hesitation arose from the persistent manner in which they, one and all, were determined to regard her as little better than a child, and had quenched any interest she expressed about any man.

'And dear mother worst of all!' she thought, as she remembered how little the good mother ever encouraged her confidence in this respect. So that all the thoughts and feelings natural to a girl of her temperament were thrown back upon herself, or given to Lotty Barton, to whom she would go round the first thing in the morning.

'Dear me! Morning! Why, here it is!' she thought. She snatched a few brief hours' sleep.

Her awakening was bright and joyous. She looked so fresh and happy at breakfast that Mrs. Lee, who had not recovered the desperate fatigue of sitting still for a whole evening, remarked—

'It is well to be young. I declare, Daphne, you must have a wonderful constitution to stand all the dancing you went through last night, and look as fresh as you do this morning.'

'I am feeling as if I had not danced at all, and quite ready for another such evening,' she said, laughing, as she thought of the secret of her freshness.

At eleven o'clock she was tripping up Miss Lotty's steps. Not finding her in her easy chair in the dining-room, she ran upstairs and knocked at her bedroom door.

'Who is it?' said Miss Lotty, in sleepy tones.

'Daphne come to see you,' she answered.

'Bless the child! What! out of bed, at the rate your limbs went last night? Wait a moment, and I'll get up and open the door for you.'

Miss Lotty always locked her bedroom door—a precautionary measure she always took after making a searching investigation under her bed, into her cupboards, and in all the suspiciously dark corners of her room, for the possible burglar who might be in hiding.

'Oh lazy old Lotty!' said Daphne, coming in and kissing her godmother heartily. 'Not up yet!'

'I should think not!' said Miss Lotty, returning to her pillows. 'After such a day as yesterday—a wedding in the morning and a ball in the evening—I declare I feel as if I must rest in bed for a week. It is the emotional part that kills me.'

'Did you cry a good deal.?'

'A wedding is always an upsetting thing. Human feeling on all sides rises to such a pitch at a marriage. One feels for the mother losing her child. One feels for the child going off all alone into the land of inexperience. One looks ahead, and wonders what will come of it all; whether good or evil. It is like standing between two great events; and of course one's blood runs faster and the tears come, thinking of the past and the future.'

'Dear old Lotty! How romantic you are!' said Daphne, perching herself on the side of the bed and taking her friend's hand.

'I know by your face that you have come to tell me something. What is it? I think I can guess—I need not ask how you feel.'

'No. Don't ask me! I feel too happy to live!' she exclaimed, with a burst of enthusiasm that made Lotty open her eyes.

'Oh dear! I see; open that drawer and get me out a smart nightcap. I was so tired last night that I took the first rag that came to hand. I can't possibly listen to a revelation of love in an unbecoming headdress.'

'Don't teaze me, Lotty. Let me put my arm round your neck and tell you.'

The joy on the girl's face told its own story.

'You never mean to tell me it is all right?' said Lotty, dragging in her favourlte climax to a love affair.

'Indeed, it is.'

'Bravo—I am delighted. No wonder you are up so early. Here, bend down, and let me kiss you this instant,' she cried, catching some of the girl's infectious joy.

'I am so glad,' she continued, after they had exchanged an emphatic embrace. 'Do you know I was almost angry with him last night. I could not make out why he neglected you all the evening. We old people at a dance live our lives over again in watching you young ones, and get as put out as possible if we don't see you receiving the attention we expect.'

'Oh, but I knew differently. We had arranged all that beforehand.'

'Dear me! How interesting! Come, now, tell me all about it. I shall never be too old for a love story. I feel like an old war horse when I hear of one, and I am young once more.'

'I can't tell you all he said, for that is sacred, you know. But he was such a darling over it all. It was in the conservatory, before supper,' said Daphne, blushing.

'Oh, you monkey! was that where you decoyed the poor man. Of course he could not help himself if he found himself in there with you,' she said, with a twinkle of her blue-grey eye. 'I believe I should never have reached this respectable stage of single blessedness, regardless even if my nightcap be becoming, if my poor old father had built a conservatory on to the end of our drawing room. They are regular man-traps for the spring gun of a "pop!"'

Daphne laughed. 'Indeed, I had nothing whatever to do with it. I thought we were going to dance; but he said I looked tired, and took me in there.'

'And of course the place was conveniently empty, with only the eyes of the flowers to shed their blessings on you—and he went down on his knees.'

'Down on his knees!' echoed Daphne, indignantly. 'As if I would marry a man who went down on his knees to me! just as they used to do in your time, Lotty, and in all the old novels.'

'Fashions change in popping the question as in the cut of one's sleeves, I suppose,' remarked Lotty.

'What a power of darkness you are for mischief this morning! But I know what you are dying for, and you shan't be told *how* he did it. You must just be satisfied to know that I love him beyond words, and have promised to be his wife.'

'Well, my love,' said Lotty, dropping her banter, 'you have my hearty congratulations and blessing for both of you, and a trifle more besides when the right time comes. I declare it will be like getting married one's self to be helping you. But now, what about your father and mother? Is it all right with them?'

'They don't know anything about it yet, but Mr. Grey said he would write to papa, and he would get the letter this morning. I expect it will be all settled by the time I get back. That is why I got out of the way this morning,' said Daphne, simply.

'I hope so, dear; but where does he propose taking you to live?'

'What do you mean?'

'Well, dear, Europe, Asia, Africa, America—where is it to be? These civil engineers are scattered all over the world, making railways, now that the United Kingdom is riddled with lines, as I know to my cost. Dear me, what I have lost in the Great Downs Southern, with the branch lines going to all sorts of impossible places that don't thank them for the convenience, for as soon as a railroad comes into a place, up goes the price of meat and everything else in proportion. There is sister Susan now, so put out at getting no dividend from that blessed line that she declares we are on the verge of the workhouse, and has begun to retrench by giving up her egg for breakfast, thinking to make up the loss that way! I let her alone, because it is a way with some people, when they want to be economical, to begin by starving their insides, and then taking it out in dress and physic. But there, this is just like me, making one of my roundabout speeches at the mention of a railway when I am wanting to hear the rest of your story.'

There is nothing more to tell.'

Oh yes, there is, my dear, as you will find. You are only just at the beginning of everything. Didn't you tell me that Mr. Grey had an appointment somewhere in that outlandish place Mexico? He surely never means to take you out there?'

'I know as much about what he intends to do as you do yourself. But, wherever it is, I'll go with him, if it is to the uttermost ends of the earth.'

'Yes; if your father and mother consent to your going about which I have my doubts.'

'Oh, Lotty, don't say so!' pleaded Daphne, as this new view of the matter was presented to her.

'You surely don't think they will raise obstacles.'

Her face wore a cloud of misgiving, the first that had chased the sunshine of her perfect happiness.

'I don't want to dishearten you, darling, only I would brace my mind if I were you to look at the matter from this point and be prepared to meet it, for I think this will be a rock ahead.'

'Oh, Lotty!'

'I know how prejudiced your good mother is on this point. When once she gets a crotchet into her head there is no moving her. She would not let a son of hers leave England—if it were to make his fortune—and I know she would still less allow a daughter to go. If Mr. Grey proposes carrying you off to Mexico, depend upon it your mother will stand out.'

'Oh, what shall I do?'

'You must just wait and see the turn things take. It may not be so bad as I expect. I shall be able to advise you better when I know more.'

'You will back me up, won't you?'

'Of course I will do all I can for your happiness, although I don't fancy losing you any more than your mother does. But we can say no more now until—'

'Until papa knows.'

'Just so. I will come round this afternoon and see and judge for myself. I won't appear to have been told anything by you. That would only vex your mother, and just now we must avoid that, if we want our own way, which of course we do.'

'I think you are right. I don't know how I shall get home for anxiety,' said Daphne, pitifully. 'I am so nervous. I am half afraid of mother. I know she will never let me go. What shall I do if she refuses?' she exclaimed passionately, all colour dying out of her face with apprehension 'It will kill me!'

'Kill you! not a bit of it, my love. We women live through tougher trials than that and don't die. Besides, don't meet troubles half-way. This may only be a surmise of mine. All depends upon what he writes to your father. So pray that his handwriting may be plain, and his subject plainer; for some men are such fools over letter-writing. I have a man of business now. . . .'

'Oh never mind your man of business,' cried Daphne, cutting short one of Lotty's branch lines of conversation. 'I could not listen. I must be going home. Mother will be wondering what has kept me. Don't fail me this afternoon, and whatever happens, of one thing I am sure—I will marry Mr. Grey, or no one. If they won't let me have him—Good heavens! I can't bear to think of such a thing,' she exclaimed with a shudder; 'I'll live and die an old maid like you.'

'You might do worse,' sighed Lotty.

'But I hope to do better,' said Daphne, recovering herself, as she kissed her old friend and wished her good-bye.

'Good-bye, you saucy thing. I expect it is my ragged old nightcap, with its smart lace all in tatters, typical of youth fallen into loveless old age, that makes you so contemptuous of my single blessedness. But God send you success, my child; and—I'll be round in the afternoon to see how you fare.'

(To be continued.)

THE PROFESSOR AND LL.D.

Words by MISS E. CHIFFIN. *Music by* R. H. MCCARTNEY, A.T.C.L.

Allegretto Scherzando.

PIANO. *mf*

Allegretto ma non troppo.

Key D. .s |d .m ,s :d' .t ,d' |l .d' :s .s ,s |l .d' :s .m ,d |m .r :r .m

1. When I was an in - fant and went to school I sat up - on a ti - ny stool, I
2. And when three years at school I'd done, They put me in - to Stan - dard One, They
3. And when I got too big, you see, To the Boys' School they pro - mo - ted me, I
4. On ac - quir-ing know-ledge my mind was bent, So to Cambridge Uni - ver - si - ty I was sent, Where

Colla Voce.

A.t.

|m .l ,t :d' ,d' .t ,l |fs .f :m .d ,d |r ,f .m ,r :s, ,l, .t, ,d |m .r :d .||

learn - ed my let - ters, my A, B, C, And add - ed up the rows of figures 1, 2, 3.
gave me all sorts of hard words to spell, And to write them with a pen - cil on a slate as well.
pass'd in all the standards with - out a slip, And at last gain'd a High School Scho - lar - ship.
I stu-died so per - se - ver - ing - ly That at last with fly - ing col - ours I took my De - gree.

a tempo. *No pause.*

L.D.

.s |d' ,d' .d' :d' .s |l .d' :s .s |l ,d' .t ,l :s ,l .t ,d' |r' .t :d' .||

I added them up so care - ful - ly,
I wrote them out in a hand so free,
That scholarship I got so eas - i - ly,
And they thought so much of that de - gree,
} That now I'm a Pro - fes - sor and an L. L. D.

No pause.

Chorus. a tempo.
f
.s | d' ,d' .d' :d' .s | l .d' :s .s | l ,d' .t ,l :s ,l .t ,d' | r' .t :d' .||
He added them up so care - ful - ly,
He wrote them out in a hand so free,
That scholarship he got so eas - i - ly,
They thought so much of that de - gree,
That now he's a Pro - fes - sor and an L L. D.
f

Verse 5. *A little slower.*

.s | d ,d .m ,s :d' .- ,d' | l ,l .d' ,d' :s .s ,s | l .d :s .m ,d | m .r ,r :r .m ,m
Now, all you lit - tle boys, who - e - ver you may be, If you wish to get to the top of the tree, Be an
Colla Voce.
A.t.
| m ,l :l ,t :d' ,d' .t ,l | r' s ,s .s ,f :m .d | r ,f .m ,r :s, ,l, .t, ,d | m .r :d .||
honour to your parents and a credit to your school, Be careful to be guided by this gold - en rule,
a tempo primo.
No pause.
f.D.
.d s | d' .d' ,d' :d' ,d' .s | l .d' :s .s ,s | l ,d' .t ,l :s ,l .t ,d' | r' .t :d' .||
Just stick to your lessons and then you'll see You may all become Pro - fes - sors and write L L. D.
a tempo primo.
No pause.

PUPIL TEACHERS' COURSE.

We were exceedingly sorry to be absolutely unable to insert our usual article for Pupil Teachers last month, but the prior claims of the Scholarship Model Answers were pressing and supreme; and as these should be exceedingly useful to Pupil Teachers, we trust that having now made our excuse we shall be forgiven.

No routines will be inserted this month, and for two reasons:—*First*, one half of the number of Pupil Teachers will be examined this month; and *second*, the other half being midway between their last and next examinations may pause and revise, in order that both sections may together begin the course in November.

Two points, then, only will be dealt with this month, *viz.*, Examination and Revision.

1. Examination and Marking.

The questions set are not difficult and the marking sometimes takes a ridiculously low standard. For instance, a candidate who has passed Standard VII. and taken an intelligent interest in the Geographical and Historical Readers used in class has not above one month's work to do throughout his first, and two months' throughout his second, year to satisfy the minimum requirements.

The following are the chief rules observed in marking.

(1) Neatness and composition (where possible) are judged of from all the papers.

(2) Any breach of rules is inexorably dealt with, such as writing between the lines.

(3) Mathematical answers, if inaccurate in result but correct in method, carry a considerable number of marks.

(4) Any evasion of subjects, such as the omission of Music, has an unfavourable effect in the totalising and summing up.

(5) The higher grant is obtained by scoring 75 per cent. of the maximum number of marks, the lower grant by 50 per cent., provided always that no subject (except Music, Geography and History) falls below 40 per cent.

(6) Less than 50 per cent. for any subject involves a 'caution' for that subject, less than 35 per cent. a 'warning.'

(7) Less than 35 per cent. of the maximum marks obtained for two successive years will entail total failure.

(8) The Music marks are reckoned in the maximum number for the purpose of calculating the above percentages, whether the Music paper has been taken or not.

Government Scale of Pupil Teacher Marks.

Subject.	*Marks.*	*Subject.*	*Marks.*
Mensuration ...	... 20	Algebra ...	... 50
Garments shown	... 30	Needlework at Examination	60
Theory of Teaching	... 40	Grammar ...	... 80
Music	... 40	Practical Skill in Teaching	80
Composition ...	... 40	Geography ...	... 80
Spelling ...	... 40	History ...	... 80
Handwriting ...	... 40	Arithmetic ...	... 100
Reading ...	... 45		
Recitation ...	... 45		
Euclid	... 50		

The day before the examination some *excellent* foolscap paper should be procured and headed with—

(1) The Pupil-Teacher's Name.
(2) The Name of School.
(3) The Pupil-Teacher's Year.
(4) The Name of the Subject.

[*E.g.*,—

James Smith. (*End of Third Year.*)

Boys' National School, Stonehill.

GEOGRAPHY.]

On *every* sheet the teacher's name and school should be written. To the examination room the teacher should take nothing more than large hand, small hand and map pens, red ink, black, blue and red leads, India rubber, penknife, *round* ruler, but no compasses. In the case of girls certain sewing materials will be needed.

Immediately after the distribution of papers listen attentively to the oral, and read carefully over the printed directions. This done, pull out your watch, place it on the desk before you, and 'fire away' at once. There need be no looking around, no exchange of glances, no notice of any Head Teacher who may enter the examination room.

Apportionate out your time so as not totally to ignore any one subject, and mind the punctuation and composition throughout all literary papers. The answers need only be numbered, the questions are not required to be transcribed.

In the Euclid Paper place the Euclid diagrams at the N.E. corner of the sheet, and repeat them, if the answer extend to two sides. Use only the middle letters of the alphabet.

In the Arithmetic Paper let every step be clearly shown, and all results intelligible. Let sums worked by unitary methods have all the equals (=) under each other, and see that any cancelling is neatly done by parallel lines, *e.g.*,

$$\frac{\overset{1}{\cancel{6}} \times \overset{1}{\cancel{5}} \times \overset{2}{\cancel{4}} \times 3}{\underset{2}{\cancel{12}} \times \underset{1}{\cancel{2}} \times \underset{2}{\cancel{10}}} = \frac{3}{2} = 1\tfrac{1}{2}.$$

The space occupied by whole numbers should be equal to that occupied by a fraction, thus :—

$$2 + \frac{3\frac{1}{2} + 4\frac{1}{2}}{5\frac{1}{2} - 2\frac{1}{2}}.$$

Use diagrams for Arithmetic where possible.

Don't leave before the allotted time, but revise and re-revise and elaborate your map.

During the noonday recess take something light to eat, not the abominable and brain-dulling pork pie, and no intoxicating beverage.

In the afternoon see that the Music Paper is attempted.

REVISION (*before examination day*):

The thoroughness with which *revision* may be accomplished depends almost entirely upon the completeness with which it has been prepared for.

If in such subjects as History and Geography the salient portions have been underlined, if supplementary information of the right kind has been marginally inserted, if in the mathematical subjects the radical portions have been by studious contrivance brought into due prominence—then revision will be a matter more of enjoyment than toil, more a joyful meeting with old friends than scraping passing acquaintance with strangers.

Revision is in its essence wholly different from 'Cramming.' The former is a refreshing of the memory, the latter is a burdening thereof.

The Reviser has taken Time by the forelock (or firelock); the Crammer sees Time a long way hopelessly ahead of him.

Such subjects as (1) History, with its dates and dynastic tables, (2) Geography, with its heights and lengths and areas, its latitudes and longitudes appertaining to the prescribed maps, (3) Recitation and (4) Text Book work in English, lend themselves readily to revision, whilst they are far too wide to be efficiently crammed.

There is one subject which, we are sorry to say, can even at this late date be mastered, if previously it have been entirely discarded—and that is Music. Whether Tonic-Solfa or the ordinary Staff Notation be employed, we venture to assert that the music marks in Pupil Teacher, Queen's Scholarship, and Certificate Examinations are those most easily learned.

VALEDICTORY :

We wish to the October-examined teachers good health, a fine examination day, suitable questions, skill in answering, benevolence in the Examiner, and the highest grant from the Department—to the April P.T's a well spent and studious half year.

(*For Correspondence see end of Certificate Article.*)

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COMMON-SENSE LESSONS IN EVERY DAY HOUSEWORK.

BY MRS. E. A. SHARMAN.

(*Lecturer to the National Health Society.*)

THE HALL.

THE proper time for cleaning the *passage* or hall of a house is the early morning. As soon as the kitchen is made tidy, and while the kettle is boiling for breakfast, there will be plenty of time to do this. The passage being small, a quarter of an hour's time given to the work of cleaning it will scarcely be noticed, if a girl will only make it a point of routine every day, and not allow herself to be put off in performing it. Schoolgirls are as much prejudiced with regard to the approach and entrance to a house as a grown-up person, and quickly decide for themselves the character of the inmates if the plot of garden in front is badly kept, the blinds drawn up awry, the windows uncleaned, the front door with a year's dust upon it, and door steps if clean, still finished off in crooked lines with hearthstone splashes everywhere. It is easy to infer that the people who live inside such a house will carry on their business in much the same style. One can scarcely believe that there are girls in such untidy looking houses, who live from day to day without noticing what a deplorable look their home presents to stranger or friend. A passage or hall ought to be cleaned once a week thoroughly. It is usually done on Saturday in a cottage home, girls having holiday from school can give more time to house cleaning on that day. On all other days plain sweeping and dusting will be sufficient.

To clean a Hall and Staircase.—The first thing done must be to close all doors which open into the passage, so as to keep the dust, when sweeping, from entering the bedrooms and sitting room. Carry all carpets and mats outside to be shaken. The stair carpet need not be shaken oftener than once a month, but stair rods ought to be polished bright once a week. They can be taken one by one and cleaned with bath-brick dust and turpentine, polishing with a leather or soft cloth. This may seem a long process, but if all the rods were taken away together, there would be great difficulty and hindrance in managing the stair carpet when replacing them. Sweep the ceiling and walls down with a clean soft sweeping brush. If you have but one sweeping brush, cover the bristles over with a large duster, pinning the corners over the head of the brush so firm that the duster cannot slip off; or wash the sweeping brush on Friday night, and in the morning it will be dry and ready for use to sweep walls and ceilings. If this work is done every week there will be no need of pinning a duster upon the sweeping brush, and will be a saving of time also. Sweep the stair carpet next, using a cane brush for the carpet, and soft hand brush for the woodwork, drawing the dust to the corner of the step nearest the wall, and sweeping it from the step into the dustpan. By this method much less dust will fly about than if it were carried to the corner of the handrail, where it would be more or less sent flying about in the air to settle again upon the newly swept walls. Remove the stair rod at each step, or there will remain a line of dust which cannot be effectually removed when dusting. Sweep the floor of the hall, and leave the dust to settle a little, while you shake and sweep the rugs and mats. If you are wishful to put a high finish upon your work, and have the staircase look very nice when done, you will take a pail of clean lukewarm water with floorcloth, such as you use for washing paints, and having wrung the cloth out of the water tightly, until it feels merely damp, wash over each step of carpet, washing the floorcloth frequently, squeezing it as dry as possible. You will thus gather up all dust without making the carpet wet, and the colours will look quite clean and fresh. Sometimes the sides of the staircase are painted a plain colour; in that case they may be kept clean by washing with lukewarm water and soap extract. If varnished, or stained with mahogany or walnut stain, wash with very weak lukewarm tea-water, after scraping off any drops of grease or hard dirt. No soap or soda must be used. The handrail can be cleaned in the same manner, polishing the top of it, if bright, with furniture polish. A stair carpet will wear much longer when *nailed* down, if thick brown paper is laid underneath it, which the nails will keep in place. In purchasing a stair carpet buy a half yard more than the actual length required for covering the stairs, and turn it under at the top or bottom when laying the carpet. In replacing the carpet after shaking, the extra length will enable you to alter the position, so that the wear of the carpet is not always upon one part. After finishing the cleaning of the staircase, dust the ledges of cornices and doors, clean

brass knobs, and wash the oilcloth, using a scrubbing brush and lukewarm water with a little extract of soap dissolved in it. Wipe dry with a soft cloth. All ordinary quality oilcloths and linoleums may be cleaned in this manner. Oilcloths will wear much longer if varnished when first laid down. In that case they must not be wetted too often, but can be kept in nice order by rubbing with a dry duster. Do not forget to dust the outside of the front door, and if at all splashed wash it with cold water and a wash-leather; this will preserve the varnish of the door. If there is a knocker avoid polishing it with *black lead*. When all is finished put the rugs and mats into their places, and you are then ready to clean the windows and front doorsteps.

To clean Windows.—Sweep away all dust first. If the windows are very high, a special brush will be needed for cleaning them. This can be made of strips of old soft woollen cloth tied upon cane, which can be made long or short by fastening one or two canes together. Any girl could make such a mop, and it would save her having to stand or sit outside windows, which is a dangerous practice when cleaning them. Use plenty of clean water, windows will not look bright if the washing water is not frequently changed. Some people still adhere to the old fashioned plan of rubbing damp whiting upon the glass, polishing when dry with a soft cloth. A much better plan is, after washing all the woodwork clean, to put a teaspoonful of ammonia into some lukewarm water, and using it and a wash-leather to clean with. Always wring the wash-leather tightly out of the water to polish with, and frequently rinse it. Ammonia put into water for general cleaning will remove dirt, smoke, grease, &c., much better than anything else, and gives windows a finer polish. Never clean windows with the sun shining upon them, or when finished they will look dry-streaked, however much one rubs. A small stick will get the dust out of the corners. Remember that window panes will be easily broken if you handle them roughly. Do not polish windows with linen, as the lint sticks to the glass, but use soft old newspaper or tissue paper if you have not a wash-leather.

To clean Doorsteps.—The process of cleaning doorsteps is similar to that of cleaning a kitchen hearth. All dust must be swept up first, then wash the steps in lukewarm water to remove dirt and hearthstone. If you are not particular in doing this thoroughly, the doorsteps will have a dingy, muddy look when dry. After washing all dirt off, rub the hearthstone over thickly, squeeze the floorcloth out of the water, and smooth the step in one straight direction, taking care not to let dirty water run down the edges in streaks or at the ends of the steps. Change the water two or three times during the cleaning, and if any part of the steps is to be plain washed do not use the remainder of the hearthstone water to wash with, or the colour of the stone will not look clear when done. After the steps are dry wipe off all superfluous hearthstone from the edges or bottom of the door. A scraper must always be polished with blacklead before the hearthstone is laid on the steps. Pick up bits of loose paper, &c., which may be found lying about, and do not forget to clean the glass on the top of the doorway. Sometimes the bottom of window-sills are cleaned with hearthstone; great care is needed in washing, or the hearthstone will disfigure the front of the house by running down in streaks.

To clean paints.—A painted room can be thoroughly cleaned by washing with plenty of clean water with extract of soap in it. Wash only a small piece at a time, and wipe dry at once with a clean soft cloth. If the moisture is allowed to remain more than a minute or two upon the walls, it will spoil the colour, making it look a paler shade and giving the wall a patchy appearance. The soda contained in the soap helps to spoil the paint. Always sweep the walls down with a soft brush before commencing to wash them.

An excellent method of cleaning and renovating white paints is first to wash the paint with lukewarm water with soap or soda, then mix a little whiting and gum water together, and wash the paint again with this, smoothing it off in a straight line. If white paint is not likely to be rubbed against, it may be improved, when looking yellow from age, by laying over it a thick coat of whiting, after the manner of using hearthstone. Painted floors need only washing with lukewarm water, and drying with a cloth. If varnished paints are washed with soapy or soda water they will soon become dull looking. A capital way is to clean them with lukewarm tea-water—that is, boiling water poured upon spent tea leaves. Use a piece of flannel to wash with. The tea-water loosens all dirt readily. The paint must be wiped dry afterwards. Never use a scrubbing brush to clean paints, or the paint will soon be scrubbed off. A stained floor can be cleaned by washing it with cold water, and when dry, rubbing with prepared bees'-wax and turpentine. Oil paint can be bought cheap and ready mixed. A girl could soon learn to paint; it is a simple operation. Use a firm brush, and move it about in the direction of the grain of the wood. By doing this, the woodwork round a sink, which is much exposed to water, may be kept from rotting. Two coats of paint must be given, the first coat being usually sucked up by the wood. Holes can be filled up with putty before painting.

A great source of waste occurs in kitchen and scullery by the manner in which hardware materials and tools are left to take care of themselves. Mops and sweeping brushes ought to be hung up when done with. Scrubbing brushes, brooms, floorcloths, and hearthstone should have proper places for keeping them when not in use. There should be plenty of nails and pegs on which to hang rough aprons and dusters. Tin pails and cans should be put aside bottom upwards; if water is left standing in them always they soon rust and wear out.

(To be continued.)

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NEW COMPOSITION STORIES FOR THE STANDARDS.

No. 1.

ADVENTURE ON A LOCOMOTIVE.—A curious adventure happened the other day to Mr. D. Campbell, inspector of the Indian Midland Railway. As he was travelling on the Cawnpore line, seated on the front part of a locomotive, he noticed in front of him a large number of vultures collecting and evidently disputing over some object, which, as the engine drew near, proved to be the carcass of a jackal, probably killed by a passing train. The locomotive, with the inspector in front, charged in among these birds, who seemed determined to abide by their prey. The result was that while some were killed others of them were thrown against Mr. Campbell, whom they straightway proceeded to attack in a most vicious manner, tearing his clothes, and inflicting considerable wounds on his hands and face. He was able, however, to retain his

position on the engine, and to defend himself from further injury, and he considers himself fortunate in escaping without anything more serious happening.

No. 2.

SNOW IN THE BALL-ROOM.—Everyone has heard of dancing on the ice; but dancing in a ball-room under a snowstorm is not so familiar. This, however, was what a party of friends found themselves doing not long ago in Sweden. The circumstances are thus described in a foreign paper:—During an extremely cold night, but with the sky clear and the stars shining, a large assembly were gathered for a ball in Sweden, and in the course of the evening it became so hot in the room that several ladies fainted. An officer tried to open a window, but he saw that the pressure of the ice was holding it fast shut. So he broke a pane, and the rush of cold coming from without produced a fall of snow in the room. The atmosphere had been charged with watery vapour, and this becoming suddenly condensed and refrigerated fell, under the form of snow, on the heads of the astonished dancers.

No. 3.

A FOX'S TRICK.—A correspondent of *Rod and Gun* calls attention to a curious habit of the fox. He says: 'My shepherd and myself were one evening attracted by the singular movements of a fox. He was walking round and round a tree, steadily keeping his eyes fixed on some object in the branches. Bushes being near, we could watch his movements without ourselves being seen. Looking in the direction in which the fox's eyes were turned, we saw a full grown pheasant roosting on one of the outer branches. The pheasant's eyes kept steadily following those of the fox. Round and round went the fox, keeping the bird fascinated with his stare. Gradually the pheasant seemed to get dazed. In a short time this was unmistakable, for at last the bird fell to the earth completely mesmerised. It was now high time for us to rush forth, as Reynard had seized his prize. This time, however, he was disappointed; for we reaped his illicit harvest.'

No. 4.

FEROCITY OF A FOX.—Some remarkable instances have been related respecting the wonderful cunning and ingenuity of foxes. Probably one of the most singular occurrences was witnessed at Horbling, a village in Lincolnshire, a few day ago. A fox with its four cubs having been compelled to retire from her quarters owing to its flooding through the recent rains, was seen frisking about with its young ones in an adjoining field. Finding she was observed, the cunning animal endeavoured to escape with her progeny. Two of the latter were taken up in her mouth and carried a short distance, then returning for the others, they were conveyed in a similar manner. Perceiving, however, her imminent peril, and finding it impossible to consult the safety of her young, rather than leave them to the mercy of her observer, she quickly commenced a terrible onslaught. One by one the cubs were attacked and killed in a ferocious manner. She then scampered off in the direction of a neighbouring covert.

No. 5.

AN ELEPHANT'S MEMORY.—An incident which corroborates the many stories as to the sagacity of the elephant occurred at Bolton, where Wombwell's menagerie had been on exhibition during the New Year's fair. Four years ago the same collection was in the town, and on that occasion, on being released from its van, a large elephant walked across the Town Hall square to a public house, and protruded its trunk into the lobby. The barmaid supplied the animal with refreshments, and the keeper, who had been in search of his charge, then conducted him to his den. On being released at the breaking up of the show this year, the same elephant broke away at a brisk trot in the direction of the hostelry, and the unwonted charge upon the premises greatly alarmed the inmates. The former barmaid, now the landlady, arrived on the scene, and, recognising her old friend, once more regaled him to his heart's content. The elephant then submitted to be led away by his keeper.

No. 6.

RESCUE BY A DOG.—A rescue by a Newfoundland dog was witnessed by the passers-by on the Thames Embankment on Monday afternoon, amidst considerable excitement. Some children were playing on the steps by Cleopatra's Needle, when one of them, a little girl about ten years of age, overbalanced herself, and fell into the water. She sank immediately, and would have been drowned had not her companions shrieked loudly for help. Captain Walter Morris happened to be passing at the time with a magnificent Newfoundland dog, and upon hearing the cries for assistance, he directed the dog's attention to the child, who had just risen to the surface. The noble animal at once sprang into the water, and reached the child in a few seconds. Seizing her by the clothing, he swam with her to the steps, where he was assisted by his master and other bystanders to land with his burden. The poor child was nearly unconscious when rescued, but after restoratives had been applied, she was in a fit state to be taken home.

No. 7.

A DONKEY'S TRICK.—I remember seeing a donkey whose antics amused me very much. It belonged to a gentleman who had great care taken of him, and he was really a beautiful creature. He was sometimes fed with oats and chopped hay, which was put into a bucket, and placed in the farmyard—partly, I believe, for a bit of fun to watch the donkey. No sooner was the dainty repast placed before him than he began to eat with great vigour, and during the process kept wheeling round and round the bucket to keep off the young colts, heifers, and pigs, which stood at a respectful distance from his heels, which he occasionally launched out in a vicious manner; and, as I understood, he was always successful in keeping the intruders away. But on this occasion, an old sow with her litter of pigs made such a determined onslaught as actually to get her snout into the bucket, when the donkey set up such an unearthly noise, braying close to the sow's ear, that she immediately beat a hasty retreat, followed by all her little ones in a state of great consternation.

—o—

QUEEN'S SCHOLARSHIP EXAMINATION, 1891.

MODEL ANSWERS TO WOMEN'S QUESTIONS.

Arithmetic.

1. (*a*) *Prove* the rule for multiplication when the multiplier is a larger number than 12 (*e.g.*, 3219 × 629),

3219		
629		
1931400	First line	= 600 × 3219
64380	Second ,,	= 20 × ,,
28971	Third ,,	= 9 × ,,
2024751	Total product	= 629 × 3219

3219 is multiplied by 6 first. But the 6 stands for 600, and accordingly the product stands for 19,314 hundreds, and the unit place is the second after the last right-hand figure in it. 3219 is next multiplied by 2. But this 2 stands for 2 tens, and accordingly the product is 6438 tens and the unit place is the next after the last right-hand figure. Lastly, 3219 is multiplied by 9. But this 9 is 9 units, and accordingly the product is 28,971 units.

∴ The first line is the sum of 600 numbers, each 3219.
∴ The second ,, ,, 20 ,, ,,
∴ The third ,, ,, 9 ,, ,,
∴ The sum of the lines is the sum of } 629 ,, ,,

Q.E.D.

(*b*) *Prove*, as to a class of beginners in the rule, that the least common multiple of 12, 28 and 42 is 84.

$12 = 2 \times 2 \times 3$
$28 = 2 \times 2 \times 7$
$42 = 2 \times 3 \times 7$
$84 = 2 \times 2 \times 3 \times 7$

First, $2 \times 2 \times 3 \times 7$ is *a* multiple, because it is plain that $\frac{2 \times 2 \times 3 \times 7}{2 \times 2 \times 3}$ and $\frac{2 \times 2 \times 3 \times 7}{2 \times 2 \times 7}$ and $\frac{2 \times 2 \times 3 \times 7}{2 \times 3 \times 7}$ are whole numbers.

Second, $2 \times 2 \times 3 \times 7$ is the *least* common multiple, because (I.) 2, 2, 3, 7 being prime numbers, it is plain that no lesser number can be substituted for any of these, and (II.), not one of the factors 2, 2, 3, 7 can be omitted without preventing the product of the others being *a* multiple.

(*c*) *Prove* the rule for reducing a fraction of any denomination to a fraction of another denomination (*e.g.*, to reduce 3s. 7½d. to the fraction of 12s. 8¼d.). Why is not the answer money?

The resulting fraction is $\frac{3s.\ 7\frac{1}{2}d.}{12s.\ 8\frac{1}{4}d.} = \frac{174 \text{ farthings}}{609 \text{ farthings}} = \frac{2}{7}$. As

The question in its simplest form may be read 'What fraction is 174 farthings of 609 farthings?'

By the definition of a fraction this is $\frac{174}{609} = \frac{2}{7}$.

The answer is not money, because the farthings in the numerator cancel the farthings in the denominator, and because the fraction may be considered a ratio which is an abstract idea, whilst money is concrete. Q.E.D.

(*d*) *Prove* the rule for finding the simple interest of a given sum at a given rate per cent. per annum (*e.g.*, £275 for three years at 7 per cent. per annum).

$$\text{Interest on £275 for 3 yrs. at 7 per cent. per annum} = \frac{\overset{11}{\cancel{275}} \times 3 \times 7}{\underset{4}{\cancel{100}}} = \frac{231}{4} = £57\ 15s.$$

Seven per cent. is a ratio or fraction denoting that for each year $\frac{7}{100}$ of the principal will be paid, and that therefore for three years $\frac{7 \times 3}{100}$ of the principal will be given as interest. But in this case the principal is £275.

$\therefore \frac{7 \times 3}{100}$ of £275 is the given interest. Q.E.D.

2. The cost price of an article is £2 12s. 6d. per ton. The selling price is £2 18s. 9d. per ton. How many tons must be sold to gain £9 5s. 11¼d.?

Gain on 1 ton = £2 18s. 9d., less £2 12s. 6d. = 6s. 3d.

Then if the total gain be £9 5s. 11¼d., there must be as many tons sold as there are 6s. 3d. in £9 5s. 11¼d.

$$\therefore \text{Number of tons sold} = \frac{£9\ 5s.\ 11\frac{1}{4}d.}{6s.\ 3d.} = \frac{8925 \text{ farthings}}{300 \text{ farthings}} = \frac{357}{12} = 29\frac{3}{4}$$

$= 29\frac{3}{4}$ tons. Ans.

3. Find, by Practice, the cost of 2 acres 3 roods 21 sq. poles 2¾ sq. yards at £53 3s. 4d. per acre.

£ s. d.
53 3 4 = cost of 1 acre
2

	£106 6 8	= cost of 2 ac. 0 rds. 0 pls. 0 yds.
2 roods of 1 acre = ½	26 11 8	= ,, 0 ac. 2 rds. 0 pls. 0 yds.
1 rood of 2 roods = ¼	13 5 10	= ,, 0 ac. 1 rd. 0 pls. 0 yds.
20 pls. of 1 rood = ⅓	6 12 11	= ,, 0 ac. 0 rds. 20 pl. 0 yds.
1 pole of 20 pls. = 1/20	0 6 7½	= ,, 0 ac. 0 rds. 1 pl. 0 yds.
2¾ yds. of 1 pl. = 1/11	0 0 7½	= ,, 0 ac. 0 rds. 0 pls. 2¾ yds.
	£153 4 4	= cost of 2 ac. 3 rds. 21 pls. 2¾ yds.

Ans.

4. A partner in a business is entitled to ⅝ of the profits. What were the average annual profits when his share for 2¼ years was £1,010 17s. 9d.?

⅝ of 2¼ years' profits = £1,010 17s. 9d.

$$\frac{1}{8} \text{ of } 1 \text{ ,, } = \frac{£1,010\ 17s.\ 9d. \times 3 \times 9}{7 \times 4} =$$

$$\frac{£144\ 8s.\ 3d. \times 27}{4} =$$

£36 2s. 0¾d. × 27 = £974 15s. 8¼d. Ans.

5. Reduce $\frac{33}{35}$ of $\frac{15}{22}$ of £2 12s. 1d. + $\frac{49}{51}$ × $\frac{34}{119}$ × £5 13s. 9d. to the fraction of £11 6s. 11d.

(I.) $\frac{33}{35} \times \frac{15}{22} \times$ £2 12s. 1d. + $\frac{49}{51} \times \frac{34}{119} \times$ £5 13s. 9d. =

$\frac{3}{7} \times \frac{3}{2} \times$ £2 12s. 1d. + $\frac{7}{3} \times \frac{2}{7} \times$ £5 13s. 9d. =

$\frac{9}{14} \times$ £2 12s. 1d. + $\frac{2}{3} \times$ £5 13s. 9d. =

6s. 3d. + £4 11s. = £4 17s. 3d. to fraction of £11 6s. 11d.

(II.) $\frac{£4\ 17s.\ 3d.}{£11\ 6s.\ 11d.} = \frac{1167d.}{2723d.} = \frac{3}{7}$. Ans.

6. Find the value of 6·9375 cwt. + ·35 of 2 qrs. 14 lbs. + ·0421875 of a ton.

6·9375 cwt. + ·35 × ½ cwt. + ·0421875 × 20 cwt. =

6·9375 cwt. + ·21875 cwt. + ·84375 cwt. = 8 cwt. Ans.

7. A can do ¼ of a piece of work in 2 hours; B can do ⅔ of the remainder in half an hour; C can then finish it in 2 hours. How long will A, B and C together take to do it?

A in 1 hour does ¼ work

B ,, ⅔ of ¾ of the work = $\frac{2}{4}$ of work

C ,, ½ of ⅔ of ¾ = ¼ of work

A + B + C in 1 hour do ($\frac{1}{4} + \frac{2}{4} + \frac{1}{4}$) of work = $\frac{4}{4}$ of work

The question now is, 'If it take 1 hour to do $\frac{4}{4}$ how long will it take to do $\frac{1}{4}\frac{0}{0}$?

1½ hrs. Ans.

8. Find a fourth proportional to ·0247, ·38 and 12·87.

N.B.—*This question is badly propounded, for it is not stated between what two terms the ratio exists, and what is the antecedent of the second ratio.* We must perchance assume that what the examiner meant is—

As ·0247 : ·38 :: 12·87 : x

Cancelling] ·0013 : ·02 :: 12·87 : x

·0001 : ·02 :: ·99 : x

$$\therefore x = \frac{·99 \times ·02}{·0001} = 9900 \times ·02 = 99 \times 2·02 = 199·9 = 200. \text{ Ans.}$$

9. A man left £36,288 to be divided between his two sons in proportion to their ages at the time of his death, which were 19 and 23 years. What sum did each receive? What difference would it have made if the father had lived three years longer?

(*a*) Younger son has $\frac{19}{42}$, and elder son $\frac{23}{42}$ of £36,288.

$\frac{1}{42}$ of £36,288 = £864.

$\therefore$ Younger son's share = 19 × £864 = £16,416.

$\therefore$ Elder ,, = 23 × £864 [*or* £36,288 − £16,416]

= £19,872. Ans.

(*b*) If the father had lived three years longer then the sons would have been 22 and 26 years old respectively.

$\therefore$ Younger son would have $\frac{22}{48} = \frac{11}{24}$, and elder son $\frac{26}{48} = \frac{13}{24}$ of £36,288.

$\frac{1}{24}$ of £36,288 = £1,512.

$\therefore$ Younger son's share would = £1,512 × 11 = £16,632.

$\therefore$ Elder ,, ,, = £1,512 × 13 [*or* £36,288 − £16,632]

= £19,656. Ans.

(*c*) $\therefore$ *Gain* to younger son = £16,632 − £16,416 = £216

$\therefore$ *Loss* to elder son = £19,872 − £19,656 = £216 } Ans.

10. If a man receives on a fourth of his capital 3 per cent., on two-thirds 5 per cent., on the remainder 11 per cent.; what percentage does he receive on the whole?

$\frac{3}{100}$ of $\frac{1}{4} = \frac{3}{400}$ of the whole.

$\frac{5}{100}$ of $\frac{2}{3} = \frac{1}{30}$,,

[Remainder = $1 - (\frac{1}{4} + \frac{2}{3}) = \frac{1}{12}$]

$\frac{11}{100}$ of $\frac{1}{12} = \frac{11}{1200}$ of the whole

$\therefore$ Fraction of the whole received = $\frac{3}{400} + \frac{1}{30} + \frac{11}{1200} =$

$\frac{9 + 40 + 11}{1200} = \frac{60}{1200} = \frac{1}{20}$ or 5 per cent. Ans.

11. If the wages of 37 men for 27 days are £233 2s., what will be the wages of 42 men for 45 days at the same rate?

Wages of 37 men for 27 days = £233 2s.

,, 1 man for 1 day = $\frac{£233\ 2s.}{37 \times 27} = \frac{£6\ 6s.}{27}$

,, 42 men for 45 days = £6 6s. × $\frac{42 \times 45}{27}$ = £6 6s. × 70.

= £441. Ans.

12. The present worth of £1,321 15s., due in 2½ years, is £1,244. Find the rate per cent. per annum simple interest.

Discount = £1,321 15s., *less* £1,244 = £77 15s.

Bnt the discount is the interest of the present worth,

$\therefore$ interest on £1,244 for 2½ years = £77 15s.

$\therefore$,, £1 1 year = $\frac{£77\ 15s.}{1244} \times \frac{2}{5}$

, £100 for 1 year = £77 15s. $\frac{2 \times 100}{1244 \times 5}$

$= \frac{£77\ 15s. \times 10}{311} = 5s. \times 10$

= £2 10s. Ans.

13. Find the exact compound interest on £3,456 for three years at 4 per cent. per annum.

Interest for first year = £3,456 × $\frac{4}{100}$ = £138·24

Principal for second year = £3,456 + £138·24 = £3594·24

Interest ,, ,, = £3594·24 × $\frac{4}{100}$ = £143·7696

Principal for third year = £3594·24 + £143·7696 = £3738·0096

Interest ,, ,, = £3738·0096 × $\frac{4}{100}$ = £149·520384

$\therefore$ Total interest = £138·2 + £143·7696 + £149·520384 =

£431·529984. £431 10s. 7·19616d. Ans.

14. What sum must be invested in a Four per Cent. Stock at 113 to produce an income of £240 6s. 8d.? (*Neglect brokerage.*)

Cash to produce £4 income = £113
" " £1 " = £$\frac{113}{4}$
" " £240$\frac{1}{3}$ " = £$\frac{113}{4}$ × £240$\frac{1}{3}$ = £$\frac{113}{4}$ × £$\frac{721}{3}$ =
£$\frac{81476}{12}$ = £6,789 8s. 4d. Ans.

Needlework.

(TWO *hours allowed for this Exercise.*)

Directions to Candidates (to accompany material.)

Cut out and tack together one-half (back and front), of the upper part of a nightshirt ($\frac{1}{2}$ size).

Make the wristband of a shirt ($\frac{1}{2}$ size), stitch it, and make a buttonhole.

Marks will be given for industry and finish.

MALE AND FEMALE CANDIDATES.

Music.

Three-quarters of an hour allowed for this Paper. Candidates must keep ENTIRELY *to one set of questions or the other. You are not permitted to answer more than* FOUR *questions.*

STAFF NOTATION.

1. Write the pitch names (C, B, etc.) and the duration names (crotchet, etc.) of the following notes, and write the signs for rests of corresponding value:

Question—

Answers—

B	D	A	F	G_1
Semiquaver.	Minim.	Semibreve.	Crotchet.	Quaver.

2. Write (*a*) a major third above each of the following notes:

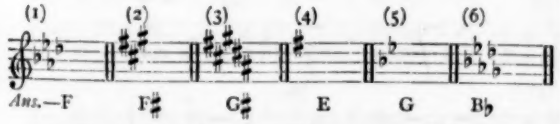
(*N.B.—The lower notes only were given on the Examination Paper.*)

and (*b*) a minor sixth above each of the following notes:

3. State what MINOR keys are shown by the following signatures:

Question—

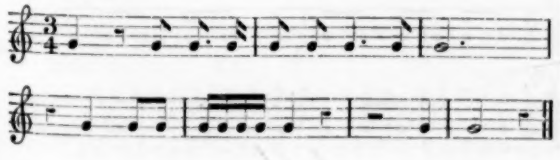
(1) (2) (3) (4) (5) (6)



Ans.—F F♯ G♯ E G B♭

4. Re-write the following in $\frac{3}{4}$ time, halving the value of every note and rest;

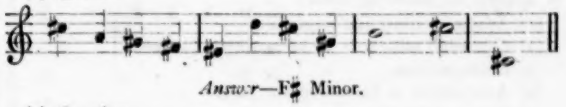
Question—



Answer—

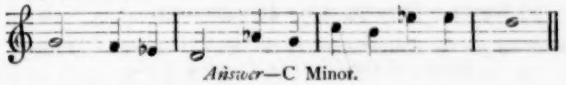
5. State the key of each of the following passages:

(1) *Question—*



Answer—F♯ Minor.

(2) *Question—*



Answer—C Minor.

6. Explain (briefly) the following terms:

(1) Adagio = Slow and expressive.
(2) Crescendo = ——— = Increasing in loudness.
(3) Lento = Slow.
(4) Accelerando = Increasing the pace.
(5) Ritard or Ritardando = Retarding or slackening the pace.
(6) Legato = Smoothly or in a gliding manner.

TONIC SOL-FA NOTATION.

1. Re-write the following:—(1) Doubling the value of every note and rest, and (2) again, halving the value of every note and rest:

Question—

| s : — | : r | m : - . d | r . d : t_1 . d |

Answers—Double value.

s : —	— : —	:	r : — }
m : —	— : d	r : d	t_1 : d ‖

Half value.

s : . r	m ., d	: r ,d . t_1 ,d ‖

2. Describe the intervals (major third, etc.) formed by the following pairs of notes:

(1)	(2)	(3)
‖ d' / m Minor Sixth.	‖ m' / f Major Seventh.	‖ ta / r Minor Sixth. ‖
(4)	(5)	(6)
‖ d' / re Major Sixth.	‖ se / t_1 Major Sixth.	‖ f / de Major Third. ‖

3. Re-arrange the following in order of pitch, placing the highest notes first:

Question—

fe s_1 r l t_1 d' s l_1 fe_1 m d r' t

Answer—

r' d' t l s fe m r d t_1 l_1 s_1 fe_1

4. Write the pulse-signs for four different kinds of measure:

(1) ‖ : | : | : | : | : | : ‖

6 Two-pulse measures. Primary Form.

(2) | : | : | : | : | : | : ‖

3 Four-pulse measures. Primary Form.

(3) | : : | : : | : : | : : ‖

4 Three-pulse measures Primary Form.

(4) | : : | : : | : : | : : ‖

2 Six-pulse measures. Primary Form.

5. Name the following relations of the minor or *lah* mode :

(1) Dominant. m
(2) Minor or essential sixth. f
(3) Leading note or essential seventh. se
(4) Supertonic. t_1

6. Explain the following terms :

(1) Adagio = Slow and expressive.
(2) Crescendo = = Increasing in loudness.
(3) Lento = slow.
(4) Accelerando = Increasing the pace.
(5) Ritard or Ritardando = Retarding or slackening the pace.
(6) Legato = Smoothly or in a gliding manner.

Directions for the Examination, by the Musical Instructor of each College, of Candidates in Practical Skill.

1. Each Candidate is to be examined separately. Not more than three Candidates at a time should be admitted to the room in which the examination is conducted.

2. Successive Candidates should not be tested with the same passages.

3. If a pianoforte is used for the EAR TESTS, the Examiner will take care that the Candidate under examination is out of sight of the keys.

4. The staff notation tests will be found equally applicable to the system of 'moveable *Doh*.' A complete set of tests under the tonic sol-fa system is given separately. Candidates should have equal credit for skill in either notation.

5. The musical capacity of Candidates unable to sing from notation can be determined by their power to imitate correctly some of the passages of the EAR TESTS sung or played to them by the Examiner.

6. In classifying Candidates, credit should be given for readiness as well as for accuracy.

7. Candidates may sing from the printed copy of the tests. For this purpose six copies are forwarded.

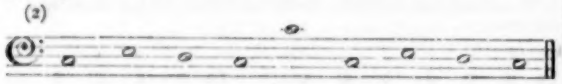
STAFF NOTATION.

NOTE TESTS.

One or more of the following passages to be sung to the sol-fa syllables or the syllable *laa*. The key note and chord to be sung or played by the Examiner. The tests written with the Bass clef should be given only to Basses.

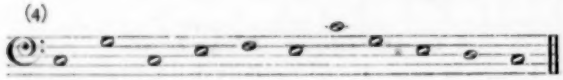
(1) Easy.

(2)



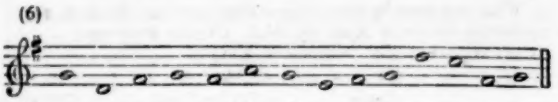
(3)

(4)



(5) More difficult.

(6)



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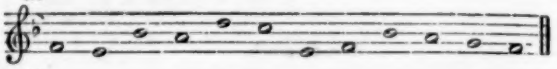

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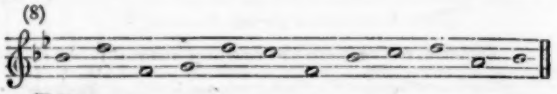
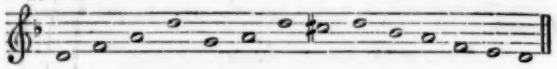


(9) Minor.



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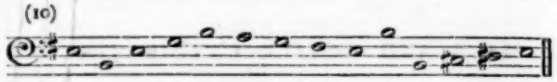

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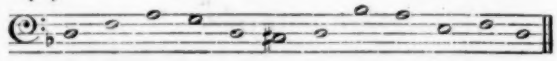
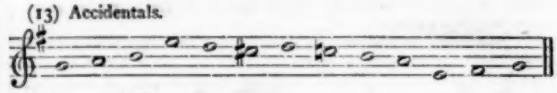
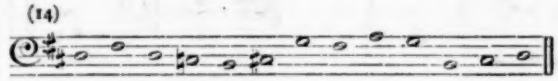
(12)



(13) Accidentals.



(14)



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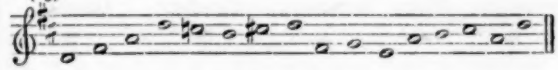

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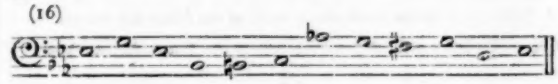
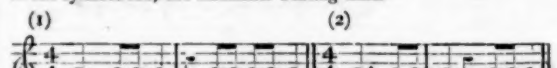


TIME TESTS.

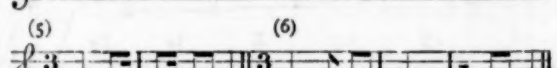
One or more of the following passages to be sung on one sound to the syllable *laa*, the Examiner beating time.

(1) (2)



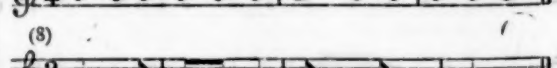
(3) (4)

(5) (6)

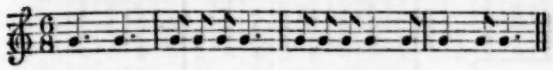


(7)

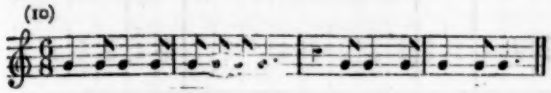
(8)



(9) (Beating twice to a bar.)



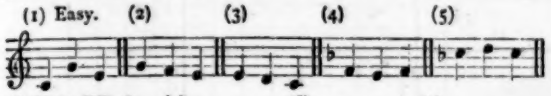
(10)



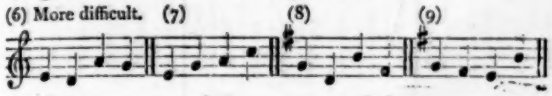
EAR TESTS.

One or more of the following passages to be twice slowly played or sung to the syllable *laa* by the Examiner, the Candidate to repeat the sounds also to *laa*, and afterwards to give the proper names (as C, D, E, or the sol-fa syllables on either the moveable *doh* or fixed *doh* plan of sol-faing). Each passage should be preceded by the key-tone and chord.

(1) Easy. (2) (3) (4) (5)



(6) More difficult. (7) (8) (9)



(10) (11) (12)

TONIC SOL-FA NOTATION.

NOTE TESTS.

One or more of the following passages to be sung to the sol-fa syllables. The key-note and chord to be sung or played by the Examiner. The key to be chosen to suit the voice of the Candidate.

(1) Easy.
|| d s m s d' s t d' ||

(2)
|| d m r d d' d m r d ||

(3)
|| d' t l s d' s l s m r d ||

(4)
|| d s d m f m d' s m r d ||

(5) More difficult.
|| d s m l s f m d' m l s d m r d ||

(6)
|| d s_1 t_1 d t_1 r d l_1 t_1 d s f t_1 d ||

(7)
|| d t_1 f m l s t_1 d f m r d ||

(8)
|| d m s_1 l_1 m r s_1 d r m t_1 d ||

(9)
|| l_1 d m l r m l se l f m d t_1 l_1 ||

(10)
|| l_1 m l_1 d m r d t_1 l_1 m m b_1 se_1 l_1 ||

(11)
|| l_1 d m f m b se l l_1 d t_1 l_1 se_1 l_1 ||

(12)
|| l_1 d m r l_1 se_1 l_1 f m t_1 d l_1 ||

(13)
|| d r m l s fe s f m r l_1 t_1 d ||

(14)
|| d m d ta_1 l_1 t_1 f m s f l_1 t_1 d ||

(15) *Doh* is D. A.t. f.D.
|| d r m d s l s r $^r s_1$ l_1 t_1 d r m d s_1 $^d s$ f m s l t_1 d ||

Doh is E♭. f.A♭. E♭.t.
|| m r d d' t l s l s f m $^m t_1$ d r m s f f m ^{m} l t d' s l s s d ||

TIME TESTS.

One or more of the following passages to be sung on one sound, the Examiner beating time.

(1)
| d :— | d .d :d | :d .d | d .d :d ||

(2)
| d :— | — :d .d | d : | d .d :d ||

(3)
| d :- .d | d .d :d .d | : | d .d :d ||

(4)
| d :— | :d .d | :— | — :— ||

(5)
| d :— :d .,d | d .,d :d .d :d ||

(6)
| d :- .d :d .d | d :— :— | :d .d :d ||

(7)
| d .,d :d .d :d .d | d :— :d .,d | d .d :d :— ||

(8)
| d :- .d | d .,d :d | d . :d . | d :— ||

(9) (Counting twice to the measure.)
| d :— :— | d :— :— | d :d :d | d :— :— }
| d :d :d | d :- :d | d :— :d | d :— :— ||

(10) (Counting twice to the measure.)
| d :— :d | d :— :d | d :d :d | d :— :— }
| : :d | d :— :d | d :— :d | d :— :— ||

EAR TESTS.

One or more of the following passages to be twice slowly played or sung to the syllable *laa* by the Examiner, the Candidate to repeat the sounds also to *laa*, and afterwards to give the sol-fa names. The tests may be given in any suitable key. Each passage should be preceded by the key-tone and chord.

(1) Easy. (2) (3) (4) (5)
|| d s m || s f m || m r d || d t_1 d || s l s ||

(6) More difficult. (7) (8)
|| m r l s || m s l d' || d s_1 m t_1 ||

(9) (10) (11) (12)
|| d t_1 l_1 m || d t_1 l s || d s fe s || d t_1 l_1 r ||

(To be continued.)

WELL-KNOWN TEACHERS AT WORK.

III.—MR. RICHARD BALCHIN, *Nunhead Passage School, Peckham Rye, S.E.*

OUR visit to the well-known school in charge of Mr. Balchin was paid by way of Peckham Rye Station. The school lies a little to the east of Peckham Rye, that splendid triangular-shaped 'city lung' of 64 acres in extent. We approached it from Rye Lane, first reaching it at the apex of the grassy and undulating common, where well kept flower-beds are overlooked by a brand-new tabernacle. A short distance beyond we came upon the Peckham Rye pond, which is not exactly a crystal pool, but this was no hindrance (but rather an attraction) to the presence there, in school hours, of a group of young urchins, all evidently of school age, who,

TIME TABLE—NUNHEAD PASSAGE SCHOOL.

NOTES.—Scripture in all Standards from 9.0 to 9.40.
Recreation in all Standards from 10.55 to 11.5, when fine.

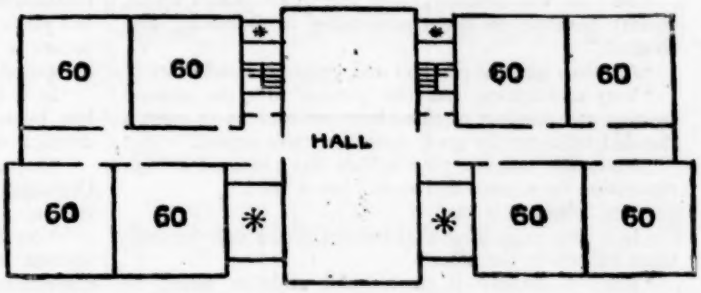
First Registration at 9.0 and 2.0 (red).
Second Registration at 9.50 and 2.15. (black).

		STANDARD VII. and EX. VII.		STANDARD VI.		STANDARD V.		STANDARD IV.		STANDARD III.		STANDARD II.		STANDARD I.	
MONDAY	MORNING	9.40 to 10.20	Arithmetic	To 10.20	Arithmetic	To 10.20	Reading	To 10.0	Spelling	To 10.0	Mental Arith.	To 10.0	Mental Arith.	To 10.0	Tables
		11.0	Geography	11.0	Reading	11.0	Grammar	10.45	Arithmetic	10.30	Reading	10.30	Grammar	10.30	Reading
		12.0	Reading	12.0	English	12.0	Arithmetic	11.30	English	11.0	Dictation	11.0	Singing	11.0	Dictation
		—	—	—	—	—	—	12.0	Reading	12.0	Arithmetic	12.0	Arithmetic	12.0	Arithmetic
	AFTERNOON	2.0 to 3.0	Mapping	3.0	Maps	3.0	Composition	2.20	Mental Arith.	2.30	Spelling	3.0	Transcription	3.0	Reading
		3.45	Science	3.45	Writing	3.45	Geography	3.0	Science	3.15	Reading	3.30	Reading	3.30	Arithmetic
		4.30	Music	4.30	Music	4.30	Drill	4.0	Drawing	4.0	Drawing	4.0	Writing	4.0	Writing
		—	—	—	—	—	—	4.30	Parsing	4.30	Singing	4.30	Drill	4.30	Singing
TUESDAY	MORNING	10.20	Arithmetic	10.20	Arithmetic	10.20	Singing	10.0	Mental Arith.	10.0	Mental Arith.	10.0	Tables	10.0	Mental Arith.
		11.0	History	11.0	Geography	11.0	Dictation	10.45	Arithmetic	10.30	Reading	10.30	Science	10.30	Reading
		12.0	Composition	11.30	Poetry	12.0	Arithmetic	11.30	English	11.0	Arithmetic	11.0	Dictation	11.0	Transcription
		—	—	12.0	Dictation	—	—	12.0	Singing	12.0	English	12.0	Reading	12.0	Arithmetic
	AFTERNOON	2.0 to 3.0	Drawing	3.0	Drawing	3.0	Drawing	2.20	Tables	2.30	Spelling	3.0	Transcription	3.0	Drawing
		3.45	Euclid	3.45	Science	3.45	Reading	3.0	Grammar	3.15	Science	3.30	Spelling	3.30	Science
		4.30	French	4.30	Discretional	4.30	Drill	4.0	Writing	4.0	Writing	4.0	Arithmetic	4.0	Poetry
		—	—	—	—	—	—	4.30	Drawing	4.30	Dictation	4.30	Drawing	4.30	Drill
WEDNESDAY	MORNING	10.20	Algebra	10.20	Arithmetic	10.20	Reading	10.0	Spelling	10.0	Mental Arith.	10.0	Mental Arith.	10.0	Tables
		11.0	Geography	11.0	History	11.0	Arithmetic	10.45	Arithmetic	10.30	Reading	10.30	Grammar	10.30	Reading
		12.0	English	11.30	Grammar	12.0	Science	11.30	English	11.0	Dictation	11.0	Singing	11.0	Dictation
		—	—	12.0	Composition	—	—	12.0	Reading	12.0	Arithmetic	12.0	Arithmetic	12.0	Arithmetic
	AFTERNOON	2.0 to 3.0	Drawing	3.0	Drawing	3.0	Writing	2.20	Mental Arith.	2.30	Spelling	3.0	Dictation	3.0	Reading
		3.45	Science	3.45	Geography	3.45	Grammar	3.0	Science	3.15	Drawing	3.30	Reading	3.30	Arithmetic
		4.30	Drill	4.30	Drill	4.30	Dictation	4.0	Drawing	4.0	Drill	4.0	Poetry	4.0	Drill
		—	—	—	—	—	—	4.30	Reading	4.30	Singing	4.30	Science	4.30	Singing
THURSDAY	MORNING	10.20	Arithmetic	10.20	Arithmetic	10.20	Geography	10.0	Mental Arith.	10.0	Mental Arith.	10.0	Tables	10.0	Mental Arith.
		11.0	History	11.0	Geography	11.0	English	10.45	Arithmetic	10.30	Reading	10.30	Science	10.30	Reading
		12.0	Composition	11.30	Poetry	12.0	Arithmetic	11.30	English	11.0	Arithmetic	11.0	Dictation	11.0	Transcription
		—	—	12.0	Dictation	—	—	12.0	Singing	12.0	English	12.0	Reading	12.0	Arithmetic
	AFTERNOON	2.0 to 3.0	Drawing	3.0	Drawing	3.0	Drawing	2.20	Tables	2.30	Spelling	3.0	Transcription	3.0	Drawing
		3.45	Euclid or Drill	3.45	Science	3.45	Reading	3.0	Grammar	3.15	Science	3.30	Spelling	.30	Science
		4.30	French	4.30	Drill	4.30	Dictation	4.0	Writing	4.0	Writing	4.0	Arithmetic	4.0	Arithmetic
		—	—	—	—	—	—	4.30	Drill	4.30	Dictation	4.30	Drawing	4.30	Drill
FRIDAY	MORNING	10.20	Algebra	10.20	Arithmetic	10.20	Reading	10.0	Spelling	10.0	Mental Arith.	10.0	Mental Arith.	10.0	Tables
		11.0	Geography	11.0	Reading	11.0	Science	10.45	Arithmetic	10.30	Reading	10.30	Grammar	10.30	Reading
		12.0	Recitation	12.0	Science	12.0	Arithmetic	11.30	English	11.0	Dictation	11.0	Dictation	11.0	Dictation
		—	—	—	—	—	—	12.0	Drill	12.0	Arithmetic	12.0	Arithmetic	12.0	Arithmetic
	AFTERNOON	2.0 to 3.0	Writing	3.0	Writing	3.0	Maps	2.20	Mental Arith.	2.30	Spelling	3.0	A Story	3.0	Tables
		3.45	Science	3.45	Geography	3.45	Geography	3.0	Transcription	3.15	Transcription	3.30	Reading	3.30	Reading
		4.30	Music	4.30	Music	4.30	Singing	4.0	Reading	4.0	A Story	4.0	Writing	4.0	Writing
		—	—	—	—	—	—	4.30	Drill	4.30	Drill	4.30	Drill	4.30	A Story

regardless of the 'School Board man,' were disporting themselves in high glee. With the true British nautical instinct, some were sailing paper boats of their own construction, while others were urging a wretched-looking mongrel to swim for sticks first thrown in by themselves. Keeping to the left of the common we soon reached a large corner house, the picture of which is now familiar to teachers throughout the country. It was the Boys' Home of the Teachers' Orphanage. Turning sharp to the left, twice, we came in sight of the now familiar red-bricked Queen Anne style of building which we at once recognised as a London Board School. Entering by the first gate, the 'Boys' entrance,' we stepped into a spacious asphalted play-ground. At the furthest corner was a gymnasium consisting of a large giant stride, parallel bars, and a couple of horizontal bars. To the right was a large covered shed. The elevation of the building, as seen from the play-ground, was well-proportioned, and of a pleasing and airy architecture. Unlike most London Board Schools, the boys' department is on the ground-floor with the girls' above. The infants' department is a separate building.

Having surveyed the exterior we proceeded to the interior by a broad and lofty corridor paved, mosaic fashion, in red tiles. On each side of us was a couple of class-rooms, and before us the entrance to the School Hall. Over its portals we noticed in bold letters a strange device. Every boy on entering school is enjoined to LEARN OR LEAVE. On the same wall, too, was a useful example of concrete arithmetic. In the vicinity of the school are three open spaces, viz., Peckham Rye, Goose Green, and Nunhead Green. The areas of these in acres were boldly displayed.

Mr. Balchin was engaged with a member of the Board; and while waiting for him we walked into the Hall, and were agreeably impressed with its large area, its loftiness, its air of comfort, and its suitability for school work. On its walls was an excellent display of attractive pictures, including several of the artistic productions of the Art for Schools Association, and the fine set of historical cartoons published by Cassell and Co. We learned afterwards that the Hall is used chiefly for drill purposes, and for gatherings of the whole school for combined instruction in Scripture knowledge and for prize distributions, &c. Beyond the Hall we found an almost exact counterpart of the first half of the school, viz., a spacious corridor with two class rooms on each side. The school is simply planned as follows:—



The eight class rooms have each accommodation for 60 boys, and each is lofty, well ventilated, and well lighted, and each class is in charge of a trained, experienced certificated master. On afterwards walking round the rooms we found separate museum cases for each class, containing suitable objects and simple apparatus for science instruction, which has always been a special subject in the school.

Rich^d Balchin.

When at length Mr. Balchin was able to see us he explained that the Rev. Stewart Headlam had unexpectedly called to see something of the elementary science teaching, and there being no opportunity to prepare apparatus, he had picked up a piece of chalk and given a conversational lesson upon its physical and chemical properties.

'Are you able,' we asked of Mr. Balchin, 'to carry out the injunction, "Learn or Leave," that we noticed over the entrance to your School Hall?'

'No boy,' said Mr. Balchin, 'has ever attended this school who has not learned *something*, so none have had to leave. If by chance a boy came determined to learn nothing, he would find himself so completely out of his element that he would of his own accord depart.'

'What class of children attend your school?'

'About 100 very poor from a very poor locality near, and 500 from quite a different locality; so that we have every variety of the elementary school class of scholars.'

'Do you find the mixing of the lowest class detrimental to the moral well-being of the better class?'

'Certainly not; on the contrary, the presence of the better class has a humanising and beneficial influence on the lowest class.'

'I understand you have the Teachers' Orphanage boys in attendance.'

'Yes, there are 35 of them, chiefly in the VI. and VII. Standards; but some in all Standards.'

'Do you find them treated in any way as inferior because they are dependent upon charity?'

'No; on the contrary, they are quite looked up to, mainly because of their proficiency in swimming and football.'

'Are their general conduct and progress satisfactory?'

'Very satisfactory. At the present time the general bearing and conduct of these boys are such as to exert a decided influence for good upon the whole school.'

'Now, Mr. Balchin, your school has obtained a high reputation for science and sports, has it not?'

'Yes, I believe it has.'

'Is it your experience that success in the one depends upon success in the other?'

'Yes; I believe it does. All athletics seem to produce a smartness and manliness in boys, which certainly manifest themselves in the school work. I consider football, if properly played, an eminently Christian game, as it necessitates a large amount of self-sacrifice.'

'What first made you take such interest in elementary science?'

'A sense of its high educative value. It is my experience that it creates a decided increase of interest in all that appertains to the work of the school.'

'Is there a continuity in your syllabus of science teaching? What subjects does the elementary work lead up to?'

'Yes. I have written a syllabus which is founded upon a knowledge of the general development of the child mind. The work, itself, leads up to physics and mechanics.'

'Who gives the instruction in Mechanics?'

'A peripatetic Instructor sent round by the Board; but his work has to be supplemented by the class-masters to make it effective.'

'Then what is the advantage of having the Instructor?'

'He brings a large quantity of apparatus to demonstrate the teaching, which could not be supplied to all schools.'

'Do you agree with this plan of peripatetic teachers?'

'Yes, certainly.'

'Now as to sports. Do you take an active personal part in them?'

'Not at present, because the assistants take it in hand. Of course, I started it.'

'Do you find your staff willingly devote their spare time to the instruction?'

'Yes; and they collect money for the purpose.'

'Your boys have gained several distinctions, have they not?'

'Yes; here is a summary of them, supplied by Mr. Mawbey, who takes very great interest in the boys' games. He informs me that our boys have won in swimming contests, 3 cups, 3 gold medals, 9 gold centre medals, 19 silver medals, and 34 other prizes, *e.g.*, silver watches, chains, desks, books, albums, etc., and in football, a challenge cup twice, and 22 silver medals in two years. In seven years the school has only failed to secure 2 challenge prizes out of 21 for which they competed.'

'Is it true that the presence of the Orphanage boys has been a special aid to your gaining these great distinctions?'

'Yes, a valuable aid, because it is a rule at the Orphanage that regular instruction be given in these things.'

'You seem, Mr. Balchin, to be working with much success here. Have you no unsatisfactory feature in connection with your school work?'

'Unfortunately, yes. I have two very prominent ones. They are the Regulations of the Board as to the infliction of Corporal Punishment, and the very irregular attendance of the lowest class of children.'

'Is it really true that none of your 8 trained and experienced assistants are allowed to inflict corporal punishment in any degree?'

'Quite true; unfortunately.'

'How does this affect the maintenance of discipline in your school?'

'Very injuriously the discipline: but most injuriously the training of the boys in manliness and straightforward honesty.'

'What do you think would be the effect of their being allowed to inflict punishment under your responsibility?'

'Very much less would be required than now; but it would be open and honest. I was assistant for some years at the Hope Street British Schools, York, and had, of course, perfect liberty as to the infliction of corporal punishment, and I am quite convinced that I used it less than is now the case on the part of assistants who are supposed not to resort to it at all."

'As to attendance: can it really be true that the Board allows such laxity of attendance and truanting as I witnessed on my way here by the pond?'

'Yes; there is a sad laxity of attendance. But the Board seems powerless. I have on the average over 100 boys always absent.'

'Then what is your percentage of attendance?'

'80 per cent.'

'What would you recommend as a remedy?'

'Putting the whole business in the hands of the police. And for this reason: wilful absence from school is now as much a crime as stealing.'

The subject of our next sketch will be Mr. ABRAHAM PARK, J.P., of the Albion Educational Institute, Ashton-under-Lyne.

SPECIMEN NOTE, TIME, AND EAR TESTS FOR THE CODE EXAMINATION.

BY W. G. McNAUGHT,

Associate of the Royal Academy of Music.

DIVISION II.—STANDARDS I. AND II.

NOTE TESTS.

Tonic Sol-fa.—To sol-fa slowly from the Examiner's pointing on the Modulator in any key—the key tone and chord being given—the tones of the Doh Chord, in any order, and the other tones of the scale in stepwise succession.

Staff Notation.—To sing slowly, as the Examiner points to the notes, and using the Sol-fa syllables, the ascending and descending notes of the scale of C, the notes of the key-chord of C (C, E, G, C) in any order, and also small groups of consecutive notes of the scale of C as written by the Examiner.

The following points should be noticed :—

1st. That any leap in the Doh Chord may be required.

2nd. That in the tonic sol-fa tests any key and consequently any tonal range may be employed.

The Code Requirement asks for only Modulator work from tonic sol-fa pupils. Teachers, however, are strongly recommended to give the tests sometimes with manual signs and sometimes from the Blackboard.

PRELIMINARY TESTS.

Tonic Sol-fa Notation.

Range **d** to **d'**. Doh as C, D, or E♭.

(35) **d m r m d s l s d s f m s l t d' ||**
(36) **m d m s d r m r d s l l s f m d' t d' ||**
(37) **s d m r d m f m m f f m f s s l s d' s d ||**
(38) **d' s m d r m s f m s d' s l s f m s l t d' ||**

Range s_1 to **s**. Doh as F, G, or A.

(39) **d t_1 d s_1 d r m d s_1 m d m r d t_1 d s s_1 d ||**
(40) **m r d s_1 d t_1 d s_1 s_1 l_1 s_1 l_1 s_1 l_1 t_1 d r d ||**
(41) **d s_1 d m s f f m m r r d s_1 d t_1 d s_1 l_1 t_1 d ||**
(42) **d r m d s_1 d r m s_1 m s_1 l_1 s_1 d t_1 d r d ||**

The above tests (35 to 42) may be sung backwards.

Staff Notation.

Although only the key of C is asked for in the Division, teachers are strongly recommended to practice reading in other keys. Where it is the intention to employ the moveable Doh method it is especially necessary to avoid keeping for a long period to one particular line or space as Doh.

Range *doh* to *doh'*.

Range *soh*$_1$ to *soh*.

(39) (Beyond the Code as to Key.)

STANDARD TESTS.

Tonic Sol-fa Notation.

Doh as C, D, or E.

(43) **d r m d s m d' d r m s l s d' m s d d t_1 d ||**
(44) **d s m d' m f s m d t_1 d r m d r m f s l s d' ||**
(45) **s d r m s l s d d' s d r d m f s l s d t_1 d m r d ||**
(46) **m d t_1 d r m s d' m s d r d m d' t l s f m d ||**
(47) **d r m f s l s l s f m r m d d' t d' s l s d r m d ||**
(48) **m s d r m s l s d' m s d s f m r m f s l s d t_1 d ||**

Doh as E, F, or G.

(49) **d s_1 d r m r m s d t_1 d r m s_1 d s f m m r d ||**
(50) **m d s_1 m r m d s_1 l_1 s_1 d t_1 d r m s s_1 l_1 t_1 d m r d ||**
(51) **d s s l_1 s_1 d t_1 d r m s $_1$ d t_1 d m r d s f m r m d t_1 d ||**
(52) **m r d t_1 d s_1 l_1 t_1 d r m r d t_1 d r m s f m s $_1$ l_1 t_1 d r d ||**
(53) **d s_1 l_1 s_1 l_1 t_1 d m r d s_1 l_1 s_1 s f m m r d t_1 d r m r d ||**
(54) **m s d t_1 d s_1 m s f m s d r m s_1 d r m s f m m r d ||**

Staff Notation.

BEYOND THE CODE.

These tests are specially for Standard II. when taught separately from Standard I. The 'Instructions to Inspectors' (par. 11) state 'that in large schools where the Standards are taught and examined separately, a higher proficiency

may be demanded in Standards II. and IV. than in the lower Standards of the same Division.' No particulars of the 'higher proficiency' expected are given. But it is reasonable to assume that it should take the form of requiring—

(1) greater fluency in singing the usual tests for the Division,
(2) easy combinations of Time and Tune, and
(3) anticipation of the work of the next Division; say easy leaps to and from any tones of the scale.

The timeless tune tests hitherto given are very dull and insipid when judged as music. In applying these tests and other similar exercises the teacher should endeavour to impart some variety and interest by pointing on the modulator or on the staff so as to *group the tones into rhythmic phrases*. When the tests are written it is more than ever desirable that the habit of grouping notes into phrases should be cultivated. No real pieces of music can be sung well unless the musical phrases are felt The first three tests below consist of test 43 above varied as suggested. The over-braces pick out the phrases, the tones in each of which should be connected without break.

(55)

d :—	r :m	d :—	s :m	d' :—	d :r	m :—	s :—
l :—	s :d'	m :—	s :d	d :—	t_1 :—	d :—	

(56)

d :r	m :d	s :—	m :—	d' :d	r :m	s :—	s :—
l :s	d' :m	s :—	d :—	d :—	t_1 :—	d :—	

(57)

d :—	r :—	m :d	s :—	m :d'	d :r
m :s	l :s	d' :m	s :d	d :—	t_1 :—	d :—

With leaps to *ray*, *fah*, *lah*, and *te*.

(For Modulator.)

Doh as C or D.

(58) d s m d s r r m s d' m s f r r m s d ||
(59) m r d s t d' m s r m d m s r t d' ||
(60) s d f m r f m r t d' d f m r d s l s t_1 d ||

Doh as G.

(61) m d s_1 l_1 s_1 t_1 d d l_1 t_1 d d d m s d f m f r d ||

Doh as F.

(62) s m f r m d t_1 d f l s d r f m d d s_1 t_1 r d ||

Doh as F.

(63) d m s m s d t_1 d s_1 t_1 r t_1 d s_1 s f m s f l s t_1 d ||

Time and Tune together.

(Written Tests.)

(64)

m :—	s :d	m :—	r :—	d :m	s :d'	t :—	l :—
l :s	m :d	l :s	m :d	f :—	m :r	d :—	

(65)

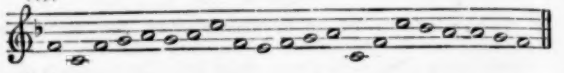
d :s_1	d :r	m :—	s :—	f :m	r :m	r :—	s_1 :—
l_1 :t_1	d :m	r :m	f :l	s :—	f :m	r :m	d :—

(66)

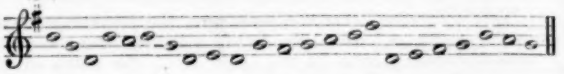
d :—	r :m	d :—	d' :—	t :l	s :l	s :—	f :—
m :—	r :d	l :—	s :—	t :d'	m :r	d :—	

BEYOND THE CODE AS TO KEY.

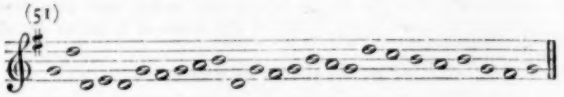
(49)



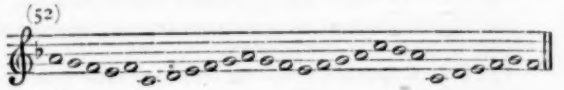
(50)



(51)

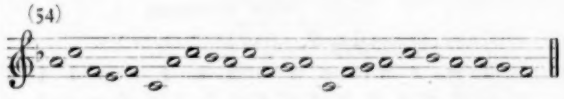


(52)



(53)

(54)



(55 to 57) are No. 43 varied in Time.)

(55)

(56)

(57)

With leaps to *ray*, *fah*, *lah*, and *te*.

(58)

Time and Tune together.

(To be continued.)

—o—

ELEMENTARY LESSONS IN AGRICULTURE.

BY PROF. GREEN,

Examiner in Botany to Cambridge University.

V.

The Plant in its Relation to the Soil.

The plants of which farm crops consist are propagated from seed. The development of the young plant from the seed, the process of germination, is dependent on the natural agencies of heat, light and moisture, but the plant cannot reach maturity without the agency of the soil. We shall see presently that the character of farm crops is largely dependent on the character of the farmer's seed-bed.

If you dig up a young bean that has begun to germinate, you will find that the seedling plant has developed, in a downward direction, a root from which spring numerous thin rootlets, while in an opposite direction a shoot consisting of stem and leaves has forced its way above the surface of the soil. The root, then, is the part of the plant that enters into intimate contact with the soil, and in considering the relation of the plant to the soil in which it grows, we are mainly concerned with the structure and functions of this organ.

In plants which, like the hemp, have an upright main stem, we find on uprooting a specimen that the first root developed becomes very vigorous, and penetrates directly downwards into the ground. This vertical growth results from the influence of the gravitation of the earth. From the main or primary root spring numerous new roots, the youngest being always nearest its growing point. These lateral or secondary roots, through the influence of gravitation, also grow towards the earth's centre, but in a more or less oblique direction. They in their turn produce numerous root-fibres. In such plants as grasses the first root of the plant soon ceases to grow, and the secondary roots which are given off from it are very numerous. These new roots penetrate into the earth, and then become branched. In both these instances we have what is called a root system, and it is important to notice that by virtue of the different action of gravitation on the main and lateral roots the entire root system is forced to grow into the soil in all directions. When the primary root continues to grow in length and remains stronger than its branches, it is called a tap root.

If we now carefully examine a young root of carrot, we shall see that it consists of a conical main root, from which are given off a number of much smaller lateral rootlets. The outside of the main root consists of a thin skin, or epidermis, next to which comes a thick orange-coloured band—the cortex—and in the centre is a bright yellow cylinder. At the apex of the root, protected by a thimble-like sheath, the root-cap, is the growing-point of the root. As the outer layers of the sheath are worn away by contact with the soil, new layers are added by the growing-point. Nearly at the end of the lateral rootlets are a number of root-hairs, which have, as we shall see presently, most important functions to perform.

The requisites of germination are moisture, warmth, and air or oxygen. In sowing his seed, the farmer by deep sowing retains the warmth and moisture contained in the soil, but decreases the supply of air. The precise depth at which it is necessary to sow the seed so as to preserve the moisture, warmth, and air necessary for germination, varies in different localities and for different seeds. As the root is the organ by which the plant takes up a good deal of food material from the soil, in preparing a seed bed it is advisable to give the roots as large an area of feeding ground as possible. You may prove how important sufficient room is to roots by a very simple experiment. You know when a sunflower is grown in the open ground in good soil it grows very tall, and has a thick stout stem, numerous very large leaves and an enormous root system. If you grow such a plant from seed in a flower pot full of good soil in the open air, though you give it plenty of water and even liquid manure, you will get but a small insignificant stunted plant. The roots have not had room enough. When you turn out the pot, you will find them all crowded together with their growing-points and delicate root-hairs

close to the inside of the pot. Most of the plant's roots are thus excluded from the soil, and though nutritive matter is given to the plant, it cannot properly employ it. When the soil, from any cause, becomes hard and close a little below the surface, such places should be broken up, or the roots of the crop sown will suffer by being confined within a small portion of the soil, and a smaller crop will result to the farmer than the ground ought to yield. The benefit of autumn or early winter ploughing is that it loosens the soil, enabling the roots to penetrate it. Some plants are naturally much more deep rooted than others. Barley and turnips are shallow rooted. On the other hand, the roots of beans, red clover, sainfoin, and lucerne extend to a depth of several feet below the surface; and wheat, carrots, parsnips, thistles, and coltsfoot are all deep rooted.

With regard to the mechanical condition of the soil, some crops, such as French clover, wheat, oats, and barley, require a firm seed-bed. Generally speaking, the smaller the seed, the less open the surface should be; for if the soil be too open, the seed may pass to a depth at which its germination is doubtful. A seed-bed should therefore combine freedom with firmness.

The functions of the root in the economy of the plant are four. It is the organ of attachment. It plays an important part in nutrition by the process of food absorption performed by its root hairs. In some cases it acts as a reservoir of reserve materials destined for the future use of the plant, and in occasional instances it becomes an organ of regeneration by producing shoots that become new plants.

The root serves as the organ of support to the plant shoot. When roots have reached the termination of their growth in length, they shorten. A tap root is thus drawn tight in various directions by its numerous side rootlets, and becomes very firmly rooted. This phenomenon may easily be observed. When the seeds of a plant which has a tap root are covered with a thin covering of soil and allowed to germinate, the seedling shoot at first rises some little way above the surface of the earth. After a few days, however, the part of the shoot beneath the first leaves is quite sunk into the earth, and these leaves lie on the surface of the soil. The tap root, the under part of which is firmly fastened in the ground by the root hairs, has shortened, and drawn the stem of the seedling into the earth.

The organs of the root which absorb the active plant food contained in the soil are the root hairs. They are very delicate narrow tubes, which are given off from the surface of the roots in very large numbers. As a root grows longer, the oldest root hairs die off as new ones arise behind the growing apex. Thus the part of the root provided with hairs moves forward in the earth and comes in contact with particles of soil which have hitherto been untouched. If you carefully lift fresh vigorous roots out of the earth, you will notice that the growing end of the root is quite smooth and clean, and so is the part of the root which lies behind the root hairs. But to the tract beset with root hairs the particles of earth cling so closely that they cannot be shaken off. This intimate growing together of the root hairs with particles of the soil has most important consequences.

The soil, as we have already seen, consists of irregular particles of mineral matter and of humus. The interspaces between these particles are usually filled with air, and each particle is covered with a thin film of water which adheres to it with considerable force. Into these interspaces the root hairs make their way, and by virtue of their extremely close contact with the particles of the soil they overcome the force of adhesion existing between the particles and their films of water, and readily absorb the water. As the particles with their films form a sort of capillary system in the soil, the absorption of water by a root hair at any point causes a flow of water towards that point from the adjacent particles. A well developed root system will thus drain a considerable area of soil. In the thin layers of water which surround the particles of soil, certain materials indispensable for the plant, *e.g.*, sulphate of lime and magnesia, are dissolved and pass into the plant in the form of a solution.

The water films which cover the particles of the soil, furnish the growing plant with nourishment, but free water—water present in the interspaces and not affected by the force of attraction—so far from being useful to the plant may be positively injurious, by preventing the free access of air to the roots. Since roots carry on respiration—*i.e.*, they absorb oxygen and give out carbonic dioxide—if the interstices of the soil get completely filled with water, they cannot absorb the free oxygen they require, and, as may easily be seen in the case of over watered pot plants, they are liable to rot away. It is most important, therefore, that soil should be well drained.

The intimate contact that exists between the root hairs and the particles of soil that adhere to them, has another most important consequence. It enables the root hairs to take from the soil a number of valuable nutritive materials which are held so fast in the soil that it is impossible for rain to wash them out. These materials—potash, compounds of ammonia, phosphoric acid, and silica—occur in chemical compounds which are retained on the surface of the particles of soil to which they form a kind of coating. The acid sap of the root hairs then comes into contact with the coatings, and renders these materials soluble. The carbon dioxide which diffuses out of roots during the process of respiration also aids this solvent action.

It follows from these facts that the root hairs, when they come into contact with small pieces of stone in the soil which contain carbonate of lime, compounds of phosphoric acid, magnesia and other mineral foods, dissolve small quantities of these salts at their surfaces to assist in the nutrition of the plant. The roots thus contribute to the chemical decomposition of the solid particles of stone in the soil, which is also effected by means of the carbonic acid contained in the soil, and the trace of nitric acid which is present in rain water.

The action of the acid sap which saturates the walls of the root hairs may be seen by the action of the root hairs on marble. If a marble slab be placed in a flower pot, and covered with soil in which a bean is placed, the roots will penetrate the soil and grow along the surface of the marble in close contact with it, and, after a time, when the slab is taken out, it will be found corroded wherever the roots have been in contact with it. The acid of the roots has dissolved and removed particles of the marble. The corrosion of the marble only at the points at which it was in contact with the roots shows that the corrosion is due not to the carbonic acid present in the soil, but to the acid sap in the walls of the root hairs.

Occasionally the root becomes a reservoir of reserve food, stored up for the future use of the plant. This is

well seen in the common beet-root, radish, carrot, turnip, and chicory root. The upper part of the tap root in these examples swells and becomes very large, sugar, starch, and other food products being stored there, which, in the next period of vegetation, are employed in the production of new shoots. The function of absorbing nutritive matter from the soil then devolves on the lateral roots which are attached as fine threads to the tap root. In some plants, such as the hop and the dahlia, the lateral roots become swollen and serve as reservoirs of future plant food.

The root is not often an organ of regeneration. There is a perennial species of cucumber, however, which has very long thin root fibres on which roundish swellings are developed, and from the upper side of these swellings numerous shoot buds arise. These shoot buds the next year grow above the soil independently of the parent plant.

To recapitulate the chief points of this brief survey of the relation of the plant to the soil: We have seen that—

I. Since the root is the part of the plant that enters into the most intimate contact with the soil, in considering the relation of the plant to the soil in which it grows we are mainly concerned with the structure and functions of this organ.

II. The root consists of three easily distinguished regions, called the epidermis, the cortex, and the woody cylinder. Owing to the attraction of the earth it grows downwards. Its growing point is protected by a root cap.

III. In sowing seed, the seed must be sown at a depth which will preserve the warmth, air, and moisture necessary for germination, and, since roots require plenty of root room, the seed bed must combine freedom with the firmness necessary to preserve the seed from being washed by the rain to a depth at which it cannot germinate.

IV. The root is the organ of support to the plant shoot. By its instrumentality the plant is firmly anchored in the soil.

V. The root hairs are the organs which absorb the active plant food contained in the soil. Their growing together with particles of the soil so closely that it is difficult to separate them has two important consequences.

(i.) From the thin layers of water which surround the particles of soil and contain certain materials indispensable for the life of the plant, these root hairs suck up valuable food in the form of a solution of these salts.

(ii.) The acid fluid contained in the walls of root hairs has the power of dissolving small quantities of salts from their compounds, which occur as a coating on the soil particles, and do not dissolve in simple water, and rendering them available as plant food.

VI. The root occasionally swells, and becomes a reservoir of future plant food, as in the case of the radish and turnip.

VII. In a few cases new shoot buds are developed from the root, which thus becomes an organ of regeneration.

(To be continued.)

QUERY COLUMN.

General.

1. X. Y. Z.—We cannot reply to anonymous queries.

2. A. Edwards.—The questions you refer to have not been published in book form by us.

3. Constant Reader.—We shall be pleased to post you a copy of the January issue of this Journal, which contains the whole of the answers you require, upon receipt of stamps 7½d.

4. Adventure.—Is it possible for a Science teacher to earn grants in Elementary Physiography without getting the elaborate list of indispensables mentioned by the Department? How much apparatus is really necessary? Can such be obtained second-hand, and at what probable cost? Short list.

A few teachers boast of having earned grants in Physiography with practically no apparatus; but such teaching is much to be deprecated. The Department inspectors now generally insist on seeing the apparatus, and, if the stock is not satisfactory, the teacher stands every chance of losing the grant. It is clearly laid down in the Science and Art Directory that no payments will be made unless a class is provided with *all* the apparatus prescribed, as all the items are really necessary for the proper teaching of the subject. Messrs. J. C. Stevens, 38, King-street, Covent-garden, W.C., often sell by auction minerals and other scientific apparatus, and we should advise 'Adventure' to communicate with them. The best thing a teacher can do is to make a lot of the apparatus himself. Those things which cannot easily be made can be obtained from Messrs. Griffin and Son, Covent-garden, Messrs. Becker and Co., Hatton-wall, Hatton-garden, and Messrs. Orme and Son, Barbican, E.C. The prices vary with the dealers. It is possible to obtain the necessary apparatus for an expenditure of from £10 to £30, according to how and where the items are obtained. We would call attention to the fact that the Department will send 'Adventure' a list of dealers who supply apparatus, and that 50 per cent. of the prices of articles may be claimed in aid of the purchase of unbreakable articles wherever the purchase is made. With reference to this, see Science and Art Directory, p. 25.

5. W. Webb.—The external and internal radii of a spherical iron shell are 11 in. and 10 in. respectively; the shell when filled with water weighs 522·4 lbs.; if the weight of a certain volume of water be represented by unity, what number will represent the weight of the same volume of iron?' (Volume of sphere = $\frac{4}{3} \times \frac{3}{7}$ (radius)^3. A cubic foot of water weighs 1,000 ounces.)

Volume of water in shell = $\frac{4}{3} \times \frac{3}{7} \times (10)^3 = \frac{88000}{21}$ cubic inches

Volume of water and iron shell together = $\frac{4}{3} \times \frac{3}{7} \times (11)^3 = \frac{117128}{21}$

$\therefore$ Volume of iron composing the shell = $\frac{117128 - 88000}{21}$

= $\frac{29128}{21}$ cubic inches.

Weight of a cubic inch of water = $\frac{1000}{1728}$ ounces.

$\therefore$ Weight of the water in the shell = $(\frac{88000}{21} \times \frac{1000}{1728})$ ounces = 2425 ounces.

$\therefore$ Weight of the iron shell = $\{(522{\cdot}4 \times 16) - 2425\}$ ounces = 5933·4 ounces.

i.e., a volume of $\frac{29128}{21}$ cubic inch of iron weighs 5923·4 ounces

$\therefore$ 1 cubic foot of iron weighs $\frac{5933{\cdot}4 \times 21 \times 1728}{29128}$ ounces

But 1 cubic foot of water weighs 1,000 ounces

$\therefore$ specific gravity of iron = $\frac{5933{\cdot}4 \times 21 \times 1728}{29128 \times 1000} = \underline{7.39}$. Ans.

6. J. B.—It is a delicate matter for us to advise a pupil-teacher on a difficulty which is represented as arising from a default on the part of the head teacher. Many young teachers doubtless experience the difficulty of which you complain. We think it a wise rule that prohibits corporal punishment by pupil-teachers, and we must regard the administering of punishment in particular cases as a question for the head teacher's judgment to decide.

We may, however, venture to hint that you may reduce your difficulty to a minimum by unceasing watchfulness, by keeping your class fully employed, by cultivating a kind but firm manner of speaking to the children, by avoiding threats as much as possible, and generally exercising that quality of patience which is the teacher's most needful possession.

One more suggestion, would it not be well to lay your difficulty respectfully before the head teacher, and ask her for guidance and help?

7. W. SPARK.—'A sphere an inch in diameter is coated with wax ·1 in. thick, and dropped into a circular vessel of water sufficiently hot to melt the wax, which then floats on the surface; determine the diameter of the vessel in order that the layer of wax so formed may have the same thickness as before.'

Volume of a sphere $= \frac{4}{3}\pi r^3$, where r = the radius and $\pi = 3{\cdot}1416$ or $\frac{22}{7}$ approx.

Volume of the sphere in question $= \frac{4}{3} \times \frac{22}{7} \times (\frac{1}{2})^3$ cubic inches $= \frac{11}{21}$ cubic inches.

Volume of the sphere and wax together $= \frac{4}{3} \times \frac{22}{7} \times (\frac{6}{10})^3$ cubic in. $= \frac{792}{875}$ cubic inches

(since the radius of the outside of the wax coating is 6 inches)

$\therefore$ Volume of the wax itself $= (\frac{792}{875} - \frac{11}{21})$ cubic in. $= \frac{1001}{2625}$ cub. in.

Let d = the required diameter of the vessel in inches.

Then $\pi \frac{d^2}{4}$ = area of the cross section of the vessel.

and $\frac{\pi d^2}{4} \times \frac{1}{10}$ = volume in cubic in. of the layer of wax $= \frac{1001}{26250}$

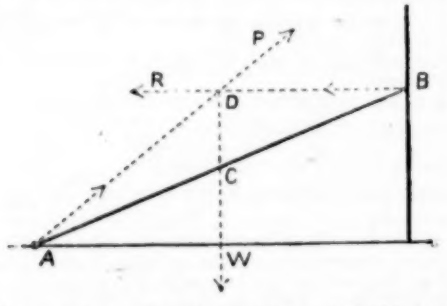
$$\therefore d^2 = \frac{1001 \times 4 \times 10}{2625 \times \pi} = \frac{1001 \times 40 \times 7}{2625 \times 22} = 4{\cdot}852$$

$$\therefore d = \sqrt{4{\cdot}852} = 2{\cdot}203.$$

8. CONNENA.—Though we are disposed to put the higher value on the London Matriculation, we think, under the circumstances you mention, the L.L.A. examination might better serve your purpose. To succeed in Matriculation you must pass in all the required subjects at the same examination. For the L.L.A. you may take the examination by instalments, and all the subjects in which the required standard is reached will be reckoned towards the diploma. In the Matriculation examination, Latin, of which you say nothing, is an essential subject. You should send for the regulations of each examination, and compare the conditions and requirements.

9. J. DIGGLE.—We are not acquainted with any more elementary book on *Metaphysics* than '*Lotze's Outlines*,' but you would possibly find that the fuller exposition of the subject in *Veitch's Hamilton* would enable you better to understand the meaning of the technical language which puzzles you. The writers who treat of mental philosophy from what may be regarded as the more practical point of view are in certain respects opposed to the teachings of the purely metaphysical school; but if you were to read *Mill's Examination of Sir W. Hamilton's Philosophy* the hostile criticism might help you to overcome your difficulties. We fear, however, that the abstruseness of which you complain is inherent in the nature of the subject. Another book you might find useful is Prof. Bain's Compendium of *Mental Science*. Both this and *Mill on Hamilton* are published by Longmans.

10. RACK.—A rod AB can turn freely round a hinge at A, and rests in an inclined position with its end B against a smooth vertical wall. Show in a diagram how the forces act which keep the rod in equilibrium, and name them. (*Science and Art.*)



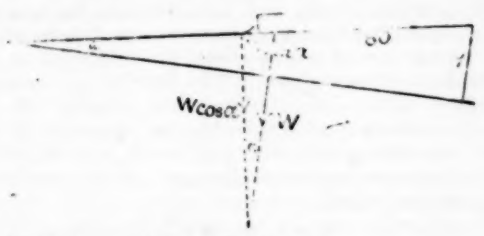
The forces acting on the rod are—(1) its weight W in a vertical direction, (2) reaction of the wall on the rod at right angles to the surface of the wall, and (3) the pressure P on the hinge at A, which *must* act through the point of intersection of the other two forces R and W.

11. LE PROVOST.—If a horse can move 30 cwt. along a level road, what can it move along a road the inclination of which is 1 in 80, the co-efficient of friction on each road being $\frac{1}{10}$?

The retarding frictional force on the level plane = co-efficient of friction × pressure on plane

$= (\frac{1}{10} \times 30)$ cwt. $= 3$ cwt.

Thus the horse is capable of just overcoming a force equivalent to the weight of 3 cwt.



Let the fig. represent the incline of 1 in 80.

Let W = the required weight.

Then the forces acting down the plane are :—

(1) the resolved part of the weight W along the plane, and (2) the frictional force (= co-efficient of friction × pressure against the plane).

(1) The component of the weight along the plane $= W \sin \alpha = \frac{W}{80}$

Pressure on the plane = component of the weight at $\perp r$ to plane $= W \cos \alpha$.

(2) $\therefore$ Frictional force $= W \cos \alpha \times \frac{1}{10} = \frac{W \cos \alpha}{10}$.

Since these are the two forces which the horse has to overcome, and having found before that the horse is capable of overcoming a force of 3 cwt., we must have $\frac{W \cos \alpha}{10} + W \sin \alpha = 3$ cwt.

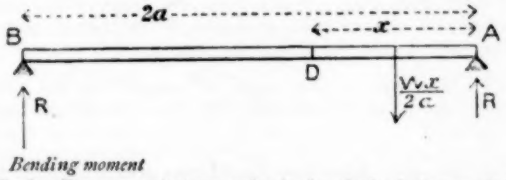
Since the angle α is so very small, $\cos \alpha$ can be taken as being 1.

$$\therefore \frac{W}{10} + \frac{W}{80} = 3 \text{ cwt.}$$

$$\therefore \frac{9W}{80} = 3 \text{ cwt.} \quad \therefore W = \frac{240}{9} \text{ cwt.}$$

$= 26\frac{2}{3}$ cwt. Ans.

12. F. SPENCE.—A given rod AB of uniform density and unloaded, except by its own weight, rests on two points, one under each end; find the shearing force and bending moment at any point D.



Bending moment

The bending moment at any point is the algebraical sum of the moments of all the forces on *either* side of such point. Let W = the weight of the rod. Also let $2a$ be the length of the whole rod, and x the distance of D from A.

The reactions R at the supports will obviously each be $\frac{W}{2}$

The weight of the length of the rod from D to A will be $\left(W \times \frac{x}{2a}\right)$, and this may be considered as acting at the middle point of DA.

Taking the algebraical sum of the moments of the forces to the right of D we have Bending Moment $= \left\{Rx - \left(\frac{Wx}{2a} \times \frac{x}{2}\right)\right\}$

$$= \frac{Wx}{2} - \left(\frac{Wx}{2} \times \frac{x}{2a}\right)$$

$$= \frac{Wx}{2}\left(1 - \frac{x}{2a}\right).$$

Shearing force.

The shearing force at any point = the algebraical sum of all the forces on *either* side of such point, taken at $\perp r$ to the length of the rod.

$\therefore$ Shearing force at D $= R - \frac{Wx}{2a}$

$$= \frac{W}{2} - \frac{Wx}{2a} = \frac{W}{2}\left(1 - \frac{x}{a}\right).$$

13. ADVANCED.—A closed circuit contains a battery of 1 ohm resistance, a reflecting galvanometer of 4 ohms, and other conductors of 2 ohms resistance. The deflection of the galvanometer is 100 divisions of the scale. What will be the deflection, assuming it to be proportional to the strength of the current when the galvanometer terminals are connected by a wire of 14 ohms resistance?

Let E = the electromotive force of the battery.

The total resistance (R) in the first case is 1 + 4 + 2 ohms, that is, 7 ohms.

Therefore, the current obtained $= \frac{E}{R} = \frac{E}{7}$, and this deflects the galvanometer 100 divisions.

In the second case, the galvanometer resistance is halved by the introduction of the shunt which joins the terminals. Thus the total resistance is 1 + 2 + 2 = 5 ohms. And as the shunt has the same resistance as the galvanometer half the current goes through each. But the current obtained $= \frac{E}{5}$, hence the current which passes through the galvanometer and causes the deflection $= \frac{1}{2}$ of $\frac{E}{5} = \frac{E}{10}$.

The currents in the two cases are therefore represented by $\frac{E}{7}$ and $\frac{E}{10}$. And since the deflection it assumed to be proportional to the strength of the current we have

$$\frac{E}{7} : \frac{E}{10} :: 100 : x$$

Therefore $x = \frac{100\,E}{10} \div \frac{E}{7} = 70$ divisions.

Algebra.

1. NEW SUBSCRIBER.—Solve :—

(1) $6(x^2+y^2+z^2) = 13(x+y+z) = \frac{4\,9\,1}{6}$, $xy = z^2$.

(2) $x^2yz = a$, $xy^2z = b$, $xyz^2 = c$.

(1) (1) $6(x^2+y^2+z^2) = \frac{4\,9\,1}{6}$
(2) $13(x+y+z) = \frac{4\,9\,1}{6}$
(3) $xy = z^2$

(2) $13(x+y+z) = \frac{4\,9\,1}{6}$

$x+y+z = \frac{3\,7}{6}$

$(x+y+z)^2 = (\frac{3\,7}{6})^2$

$x^2+y^2+z^2+2xy+2xz+2yz = \frac{1\,3\,6\,9}{3\,6}$

(1) $x^2+y^2+z^2 = \frac{4\,9\,1}{3\,6}$

$\therefore\ 2xy+2xz+2yz = \frac{1\,3\,6\,9}{3\,6} - \frac{4\,9\,1}{3\,6}$

$= \frac{7\,4}{3}$

$xy+xz+yz = \frac{3\,7}{3}$

(3) $xy = z^2$

$\therefore\ z^2+xz+yz = \frac{3\,7}{3}$

$z(x+y+z) = \frac{3\,7}{3}$

$z \times \frac{3\,7}{6} = \frac{3\,7}{3}$

$\therefore\ z = \frac{3\,7}{3} \times \frac{6}{3\,7}$

$= 2.$

(2) $x+y+z = \frac{3\,7}{6}$

$x+y+2 = \frac{3\,7}{6}$

$x+y = \frac{3\,7}{6}$

(3) $xy = z^2$

$xy = 4$

$(x+y)^2 = (\frac{3\,7}{6})^2$

$x^2+2xy+y^2 = \frac{1\,3\,6\,9}{3\,6}$
$4xy = 16$

Subtracting] $x^2-2xy+y^2 = \frac{4\,9}{3\,6}$

$x-y = \pm\frac{7}{6}$
$x+y = \frac{3\,7}{6}$

$2x = \frac{1\,8}{3}$ or 3

$\therefore\ x = \frac{3}{2}$ or $\frac{2}{3}$.

$2y = 3$ or $\frac{1\,8}{3}$

$\therefore\ y = \frac{3}{2}$ or $\frac{8}{3}$.

$\therefore\ x = \frac{3}{2}$, $y = \frac{3}{2}$, $z = 2$
or $x = \frac{3}{2}$, $y = \frac{8}{3}$, $z = 2$

(2) (1) $x^2yz = a$
(2) $xy^2z = b$
(3) $xyz^2 = c$

First Solution :

(1) ÷ (2) $\left.\begin{matrix}\\(1) \div (3)\end{matrix}\right\}$ $\left.\begin{matrix}\frac{x}{y} = \frac{a}{b}\\ \frac{x}{z} = \frac{a}{c}\end{matrix}\right\}$

$$\frac{x}{y} \times \frac{x}{z} = \frac{a}{b} \times \frac{a}{c}$$

$$\frac{x^2}{yz} = \frac{a^2}{bc}$$

$$x^2yz \times \frac{x^2}{yz} = a \times \frac{a^2}{bc}$$

$$x^4 = \frac{a^3}{bc}$$

$$\therefore\ x = \pm\sqrt[4]{\frac{a^3}{bc}}$$

$$\frac{x}{y} = \frac{a}{b}$$

$$\frac{x^4}{y^4} = \frac{a^4}{b^4}$$

$$y^4 = x^4 \times \frac{b^4}{a^4}$$

$$= \frac{a^3}{bc} \times \frac{b^4}{a^4}$$

$$= \frac{b^3}{ac}$$

$$\therefore\ y = \pm\sqrt[4]{\frac{b^3}{ac}}$$

$$\frac{x}{z} = \frac{a}{c}$$

$$z^4 = x^4 \times \frac{c^4}{a^4}$$

$$= \frac{a^3}{bc} \times \frac{c^4}{a^4}$$

$$= \frac{c^3}{ab}$$

$$\therefore\ z = \pm\sqrt{\frac{c^3}{ab}}$$

Second Solution :

(1) × (2) × (3)] $x^4y^4z^4 = abc$

$$xyz = \pm\sqrt[4]{abc}$$

$$\frac{x^2yz}{xyz} = a \div \pm\sqrt[4]{abc}$$

$$\therefore\ x = \pm\sqrt[4]{\frac{a^4}{abc}}$$

$$= \pm\sqrt[4]{\frac{a^3}{bc}}.$$

Similarly the values of y and z can be found.

2. STUPID.—Solve :—

$$\sqrt[m]{(1+x)^2} - \sqrt[m]{(1-x)^2} = \sqrt[m]{1-x^2}.$$

$$\sqrt[m]{(1+x)^2} - \sqrt[m]{(1-x)^2} = \sqrt[m]{1-x^2}$$

$$(1+x)^{\frac{2}{m}} - (1-x)^{\frac{2}{m}} = (1-x^2)^{\frac{1}{m}}$$

$$\frac{(1+x)^{\frac{2}{m}}}{(1+x)^{\frac{1}{m}}(1-x)^{\frac{1}{m}}} - \frac{(1-x)^{\frac{2}{m}}}{(1+x)^{\frac{1}{m}}(1-x)^{\frac{1}{m}}} = 1$$

$$\frac{(1+x)^{\frac{1}{m}}}{(1-x)^{\frac{1}{m}}} - \frac{(1-x)^{\frac{1}{m}}}{(1+x)^{\frac{1}{m}}} = 1$$

$$\left(\frac{1+x}{1-x}\right)^{\frac{1}{m}} - \left(\frac{1-x}{1+x}\right)^{\frac{1}{m}} = 1$$

Put y for $\left(\frac{1+x}{1-x}\right)$;

$$\text{Then } y^{\frac{1}{m}} - \frac{1}{y^{\frac{1}{m}}} = 1$$

$$y^{\frac{2}{m}} - 1 = y^{\frac{1}{m}}$$

$$y^{\frac{2}{m}} - y^{\frac{1}{m}} = 1$$

$$y^{\frac{2}{m}} - y^{\frac{1}{m}} + (\tfrac{1}{2})^2 = 1 + \tfrac{1}{4} = \tfrac{5}{4}$$

$$y^{\frac{1}{m}} - \tfrac{1}{2} = \frac{\pm\sqrt{5}}{2}$$

$$y^{\frac{1}{m}} = \frac{1 \pm \sqrt{5}}{2}$$

$$\therefore y = \frac{(1 \pm \sqrt{5})^m}{2^m},$$

$$\frac{1+x}{1-x} = \frac{(1 \pm \sqrt{5})^m}{2^m}$$

$$\left\{\begin{matrix}\text{Numerator} - \text{Denominator} \\ \text{Numerator} + \text{Denominator}\end{matrix}\right\}$$

$$\frac{2x}{2} = \frac{(1 \pm \sqrt{5})^m - 2^m}{(1 \pm \sqrt{5})^m + 2^m}$$

$$\therefore x = \frac{(1 \pm \sqrt{5})^m - 2^m}{(1 \pm \sqrt{5})^m + 2^m}.$$

Arithmetic.

1. VENITIA.—A man went to market and spent £200. He bought 200 animals consisting of sheep, pigs, and young geese. He gave £5 for each sheep, £1 for each pig, and 1s. for each goose. How many of each did he buy?

Average price per animal = £200 ÷ 200 = £1.
Difference between average price and price of a sheep
= £5 − £1
= £4.
Difference between average price and price of a goose
= £1 − 1s.
= 19s.

$$\therefore \text{No. of sheep : No. of geese :: } \begin{matrix}\text{s.} & \text{£} \\ 19 & 4\end{matrix}$$
$$:: 19 : 80;$$

$$\left.\begin{matrix}\therefore \text{No. of sheep} = 19 \\ \text{,, ,, geese} = 80 \\ \text{,, ,, pigs} = 200 - (19 + 80) \\ = 101\end{matrix}\right\}$$

or,

$$\left.\begin{matrix}\text{No. of sheep} = 19 \times 2 \\ = 38 \\ \text{,, geese} = 80 \times 2 \\ = 160. \\ \text{,, pigs} = 200 - (38 + 160) \\ = 2.\end{matrix}\right\}$$

2. J. ROGERS.—The average age of a form of 20 boys is 14·31 years, but another boy coming the former average is raised ·92$\frac{5}{9}$ per cent.; find the age of the new comer.

Age of the new comer—

$$= 14{\cdot}31 \text{ yrs.} + (92\tfrac{5}{9}\,\% \text{ of } 14{\cdot}31 \text{ yrs.} \times 21)$$
$$= \left(14{\cdot}31 + \frac{\overset{25}{\cancel{92}\cancel{5}}}{\underset{27}{\cancel{999}}} \times \frac{\overset{53}{\cancel{14{\cdot}31}}}{\underset{4}{\cancel{100}}} \times \frac{21}{1}\right) \text{yrs.}$$
$$= \left(14{\cdot}31 + \frac{11{\cdot}13}{4}\right) \text{yrs.}$$
$$= (14{\cdot}31 + 2{\cdot}7825) \text{ yrs.}$$
$$= 17\ 0925 \text{ yrs.}$$
$$\underline{\quad 12 \quad}$$
$$\underline{11{\cdot}1100 \text{ mos.}}$$
$$= \underline{17 \text{ yrs. } 1{\cdot}11 \text{ mos.}} \text{ Ans.}$$

3. W. S.—A, B, and C have a sum divided between them. C gets twice as much as A; A and B together get £50; B and C together get £60; find the sum of money and how much each person gets.

(*1st Stage Mathematics 1890.*)

A's share + B's share = £50
B's share + C's share = £60
Twice A's share + B's share = £60
∴ A's share = £60 − £50
= £10;
B's share = £50 − £10
= £40;
C's ,, = £10 × 2
= £20;
Sum = £10 + £40 + £20 = £70.

4. W. S.—A and B together can do a piece of work in 5$\frac{2}{3}$ days; A does twice as much as B in a given time. Find how long it would take A alone to do the work.

(*1st Stage Mathematics, 1891.*)

Part done by A and B in one day = 1 ÷ 5$\frac{2}{3}$
= $\frac{3}{17}$,
3 times part done by B in one day = $\frac{3}{17}$,
∴ Part done by B in one day = $\frac{1}{17}$,
,, A ,, = $\frac{2}{17}$,
∴ A could do the work in $\frac{17}{2}$ days = $\underline{8\frac{1}{2} \text{ days.}}$ Ans.

5. XMAS.—Prove that if C be a measure of A and B, it will also measure m A ± n B.

Let A contain C x times,
and let B ,, C y ,,
Then m A = mx C
and n B = ny C,
∴ m A ± n B = mx C ± ny C
= C ($mx \pm ny$),
∴ $\underline{\text{C measures } m \text{ A} \pm n \text{ B.}}$

6. BLACKIE.—What would it cost at 4d. per square yard to paint the walls of a room which is 13 ft. 6 in. long, 11 ft. 7 in. wide, and 9 ft. 3 in. high?

Perimeter of room = (13 ft. 6 in. + 11 ft. 7 in.) × 2
= 25 ft. 1 in. × 2
= 50$\frac{1}{6}$ ft.;
Area of walls = (50$\frac{1}{6}$ × 9$\frac{1}{4}$) sq. ft.
= ($\frac{301}{6}$ × $\frac{37}{4}$ × $\frac{1}{9}$) sq. yds.;
Cost = $\left(\frac{301}{6} \times \frac{37}{4} \times \frac{1}{9} \times \frac{4}{1}\right)$d.
= $\frac{11137}{54}$d.
= 206$\frac{13}{54}$d.
= $\underline{17\text{s. } 2\frac{13}{54}\text{d.}}$ Ans.

7. CLAUDE.—Under the old tariff a telegram of 20 words, exclusive of the names and addresses of the sender and recipient, could be sent for 1s., and for each five words or fewer beyond the 20 the charge was 3d. Under the new tariff the charge for each word, inclusive of names and addresses, is $\frac{1}{2}$d. A certain telegram would have cost 15d. under either tariff, but if 9 words had been added to the body of the telegram (the addresses remaining the same) the cost under the new tariff would have been 1$\frac{1}{2}$d. greater than under the old. Find, by a clear process of reasoning, what was the number of words in the body of the telegram.

No. of additional words = 9,
Extra cost under new tariff = 4$\frac{1}{2}$d.,
,, ,, old ,, = 4$\frac{1}{2}$d. − 1$\frac{1}{2}$d.
= 3d.,
No. of words for which no extra charge would have been made under old tariff = 9 − 5 = 4,
∴ No. of words in body of telegram = 25 − 4 = $\underline{21.}$ Ans.

Geometry.

1. BEN DORAN.—ABC is a triangle, whose sides are 9, 12, and 15 feet respectively. Find the magnitude of the angle subtended by the longest side.

$$9^2 + 12^2$$
$$= 81 + 144$$
$$= 225$$
$$= 15^2;$$

∴ Angle subtended by the longest side is a right angle. (I. 48.)

Note.—Each correspondent is restricted to *one* question. (See Rule 1.)

2. H. S. TUCKER.—If the exterior angles of a regular polygon are each equal to one-sixth part of a right angle, how many sides has the polygon?

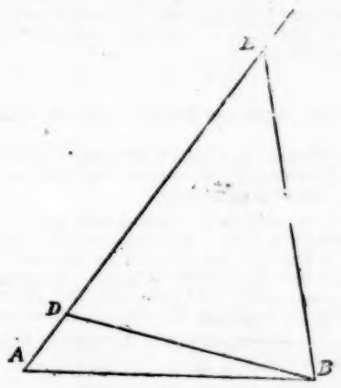
The exterior angles of the polygon = 4 right angles, (I. 32. Cor. 2.)

∴ Each exterior angle = 4 right angles ÷ number of sides,

$$\frac{4 \text{ right angles}}{\text{number of sides}} = \tfrac{1}{6} \text{ right angle},$$

Number of sides = 4 right angles ÷ $\frac{1}{6}$ right angle
= 4 × 6
= 24. Ans.

3. TUCKER.—Show how to construct a triangle having given one side, an adjacent angle, and the difference of the other two sides. (*Naval Cadet Exam. 1891.*)



Let AB be the given base, BAC the given angle, and AD the difference of the other two sides.

Construction.—Join DB. At the point B make the angle DBE = angle BDE. (I. 23.) Then EAB shall be the triangle required.

Proof.—Angle EBD = angle EDB. ∴ EB = ED, (I. 6.) Wherefore AD is the difference between the sides AE, BE.

∴ Triangle AEB is the triangle required. Q.E.F.

Trigonometry.

1. C. W. G.—Find A, having given :—

(1) $a = 37$, $b = 13$, $c = 30$.

(2) $a = 409$, $b = 241$, $c = 600$.

(1) $\sin A = \frac{2}{bc}\sqrt{s(s-a)(s-b)(s-c)}$

$= \frac{2}{13 \times 30}\sqrt{40 \times 3 \times 27 \times 10}$

$= \frac{2 \times 20 \times 9}{13 \times 30}$

$= \frac{12}{13}$;

L sin A = 10 + log 12 − log 13
= 10 + 1·0791812 − 1·1139434
= 11·0791812—1·1139434
= 9·9652378;

L sin 67° 23′ = 9·9652480
L sin 67° 22′ = 9·9651953
·0000527
9·9652378
9·9651953
·0000425

$\frac{425}{527}$ of 60″ $= \frac{25500''}{527} = 48''$;

L sin A = L sin 67° 22′ 48″,
Angle A is obtuse,
∴ A = 180° − 67° 22′ 48″
= 112° 37′ 12″.

(2) $\sin A = \frac{2}{bc}\sqrt{s(s-a)(s-b)(s-c)}$

$= \frac{2}{241 \times 600}\sqrt{625 \times 216 \times 384 \times 25}$

$= \frac{1}{241 \times 300}\sqrt{25^2 \times 36 \times 6 \times 6 \times 6 \times 64 \times 5^2}$

$= \frac{25 \times 36 \times 8 \times 5}{241 \times 300}$ (2, 12, 3)

$= \frac{360}{723}$;

L sin A = 10 + log 360 − log 723
= 10 + log 36 + log 10 − log 723
= 10 + 1·5563025 + 1 − 2·8591383
= 12·5563025 − 2·8591383
= 9·6971642;

L sin 29° 52′ = 9·6972148
L sin 29° 51′ = 9·6969947
·0002201
9·6971642
9·6969947
·0001695

$\frac{1695}{2201}$ of 60″ $= \frac{101700''}{2201} = 46''$;

Angle A is acute,
∴ A = 29° 51′ 46″.

—o—

THE 1892 SCHOLARSHIP EXAMINATION.

BY DR. GEORGE BEACH, M.A.

Co-Author of 'A Manual of our Mother Tongue,' 'A Girls' Arithmetic,' Author of 'Elements of English,' 'Entertaining Readers,' etc.

1. It is hoped that by this time all our readers will have well studied the very complete Model Answers of the 1891 Scholarship Examination, which were inserted in our last issue.

They fully exemplify how to answer Scholarship questions. Examination answering is now a fine art, and no matter how overflowing with knowledge a candidate may be, unless that knowledge be *first*, suitable; *second*, its proper details selected for exhibition; unless, *third*, the arrangement be logical and scientific; *fourth*, the salient portions duly emphasised; *fifth*, all aids to clearness utilised, and *sixth*, neatness and style be carefully attended to—unless, we say, all these points are kept clearly and constantly in view good marks cannot be obtained.

Having last month's PRACTICAL TEACHER *before us*, let us cull a few hints, from pp. 143 to 158, on the manner of answering.

From the Grammar Paper we discover the proper length of the required essay, the best tabulation for analysis, and an illustration of paraphrasing. Answer (5) is an instance of good arrangement and selection, and if it were in a framework of lines would score high. Note that the suffixes chosen are all different, and that no secondary ones such as *-ously* appear.

In Question 6 many candidates altogether omitted instances of noun sentences which formed the subject. Whilst speaking of noun sentences it may be asked, 'Why can we have noun sentences in the place of nominative and objective nouns, but not in the place of possessive nouns?' The reply is, 'That the possessive case is really of the nature of an adjective.'

In the Historical Answers, Question 13 affords a striking example of the elucidation afforded by diagrams, &c. Such rough sketches as those on p. 149 are within the range of anybody's skill, and actually double the value of the reply.

Examine Question 3 of School Management, both as an example of the contrast asked for, and as an instance of composition. In order to prevent repetition, see how the words '*Wellington*,' '*Great Duke*,' '*former*,' '*Englishman*,' '*one*,' '*chief*,' all refer to

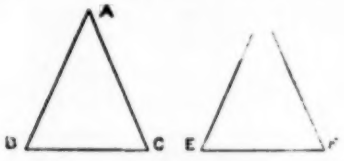
the same person. Our pupils should pay great attention to the use of synonyms, quasi-synonyms, or substitutive words, as thereby greater literary beauty may be manifested.

We might proceed throughout all the Model Answers, culling therefrom hints as to the proper style of replying; but, surely, enough has been said to incite the pupil to a careful study of them.

2. The Male Candidates will do well to study the alternative proofs of *Euclid, Book I., Propositions* 5, 7, 8, 17, 18, 24, 26, 30, 32 (2nd Coroll.), 47 and 48, and also *Book II., Propositions* 4, 5, 6, 7, 9, 10, without any 'construction.'

The criticisms upon Axiom XII. should be mastered, and the full significance of such phrases as the following should be thoroughly understood:—

(1) Each to each, (2) side remote from, (3) reductio ad absurdum, (4) converse proposition, (5) Q.E.D., (6) Q.E.F., (7) Postulate, (8) Axiom, (9) Problem, (10) Theorem, (11) Corollary, (12) Adjacent, Alternate, Reflex, Supplementary and Complementary Angles, (13) towards the same parts.

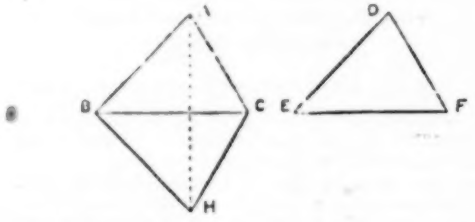


PROP. 5, BOOK I. (*Alternative Proof*):

Let ABC be an isosceles triangle, having AB = AC, and let DEF be a triangle equal to ABC in all respects.

Apply the △ DEF to ABC so that the point D may be on A and the straight line DF on AB, then the point F will coincide with B because DF = AB, and DE will coincide with AC because ⋀s BAC and FDE are =. Also point E will coincide with C because DE = AC. Then also, as in I. 4, FE will coincide with BC and ⋀s ABC and DFE will coincide and therefore will be =. But by hypothesis ⋀s ACB and DFE are =, ∴ also ⋀s ABC and ACB are =.

Q.E.D.



PROP. 8, BOOK I. (*Alternative Proof*):

Case I. BA = ED, AC = DF, and CB = FE, then ⋀s BAC and EDF are =.

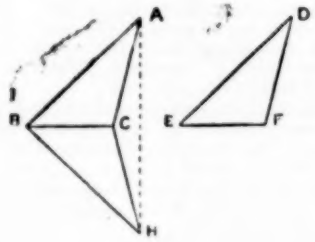
Apply the point E to the point B and BC to EF so that the point D may fall at H on the side of BC remote from A. Then F and C will coincide because BC and EF are =.

Join AH.

Then by I. 5 ⋀s BAH and BHA are =, and ⋀s CAH and CHA are =.

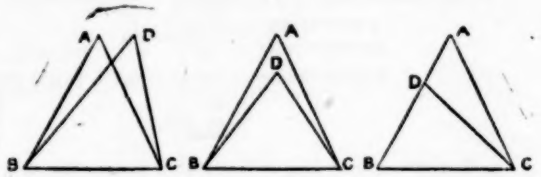
Therefore, also ⋀s BAC and BHC viz., ⋀s BAC and EDF, are =.

Case II. When BCA and EFD are obtuse is left to the reader to solve.



PROP. 7, BOOK I. (*Alternative Proof*):

Prop. 8 being proved independently of Prop. 7, this latter may now be easily demonstrated by means of the former.



Let ABC and DBC be two triangles which have a common base BC and with the sides AB and DB = and also the sides AC and DC =. Because sides AC and CB = each to each DC and CB and base AB = base BD, ∴ ⋀s ACB and DCB are =, which is absurd, etc. Q.E.D.

THESE NOTES ON EUCLID WILL BE CONTINUED.

3. The Women Candidates must devote particular attention to Domestic Economy, as this subject has been unexamined during their four years of apprenticeship.

Although no syllabus has been issued, yet for the last twenty years the questions have been arranged under the following heads, generally in five but sometimes in six sections:—I., *Needlework*; II., *Savings and Investments*; III., *Food, its ingredients and preparation* (occasionally two sections); IV., *Health and Sickness* (occasionally two sections); V., *Clothing and Washing.*

From twelve or fourteen queries are set, of which only five or six are to be answered.

Only one in each section may be attempted.

We give underneath the favourite points touched upon.

I. *Needlework, etc.*

Definition of 'plain' needlework; description of the different *patches*, gathering, *darning*, purling, whipping and setting on frill, hemming, felling, back-stitching, feather-stitching; description of the stitches required for *woman's night dress, flannel shirt, calico shirt, pinafore*, and any under-clothing; directions for sewing on a string, a button, and for mending a table-cloth, *a flannel petticoat*, and the *heel of a stocking*; knitting a whole stocking, *the toe*, knitting articles with two needles; cutting out of *pinafore*, baby's frock, man's shirt and *boy's shirt*; how ought old clothing and household linen to be utilised?; what are the Code requirements in needlework for Standards III., IV., and Scholarship Candidates?; should a sewing machine be commonly used?; *outfits for school-mistress, Training College student, pupil teacher*; *outfits for servants of various ages, going out in divers capacities.*

II. (*a*) *Savings, etc.*

Details of town and country teachers' expenditure; reasons for the difference of rural and urban salaries; *apportionment of teachers', tradesmen's, artisans', labourers' incomes*; details of economy and frugality; *proportion of savings to income.*

II. (*b*) *Investments, etc.*

Investment of a mistress' savings; *post-office facilities for saving*; *annuities*; safe investments; benefit clubs, building societies, insurance companies, government stock.

III. *Ingredients of food, etc.*

Needs of the bodies of children and adults; temperature of body; *classes of foods*; flesh, fish, and vegetable diets; effect on body of carbon, sugar, lime, salt, oil; the special properties and constituents of water, *milk*, beer, ordinary vegetables, cereals, sago, tapioca, *arrowroot, eggs, cheese, fish*, and *lean beef*; cost of food.

THESE NOTES ON DOMESTIC ECONOMY WILL BE CONTINUED. The favourite questions are italicised.

4. ALL STUDENTS WHO REALLY WISH TO PASS SHOULD JOIN OUR CORRESPONDENCE CLASS.

SCHOLARSHIP ROUTINE FOR **OCTOBER, 1891.** (MEN AND WOMEN.)

DAYS	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	Algebra up to Simple Equations. Questions on Needlework	History from 1819 to 1836	Language	Algebraic Fractions. Ingredients of Food	Dates from 1819 to 1848	Language	Algebraic Square Root. Rules of Health	History from 1848 to 1856	Language	Algebraic Cube Root. Miscellaneous History	Dates from 1848 to 1867	Language
TUESDAY	Props. 9, 10 and 11 of Euclid, Book II. Cut out a paper pattern of a pair of child's drawers	Revise Geography of Europe	Science	Props. 12, 13 and 14 of Euclid, Book II. Cut out a paper pattern of a child's frock bodice	Revise Geography of Hindostan	Science	Props. 1, 2, 3 and 4 of Euclid, Book II. Hedge-tear darn	Geography of the West Indies	Science	Props. 5, 6, 7, 9 of Euclid, Book II. Cross-cut darn	Geography of New Zealand	Science
WEDNESDAY	Clock Sums	History of English Language	Drawing	Proofs of Rules in Arithmetic	Paraphrasing and Penmanship	Drawing	Cube and Square Root. Square Root	Table of English Literature	Drawing	Stocks	Teutonic Prefixes and Affixes	Drawing
THURSDAY	Algebraic Factors. Savings and Investments	History from 1836 to 1848	Language	Fractional Simple Equations. Preparation of Food	England under the Plantagenets	Language	Algebraic Square Root. Clothing and Washing	History from 1856 to 1867	Language	Problems leading to Simple Equations. Revise Dates	England during the Wars of the Roses	Language
FRIDAY	Revise Props. 6 to 32 of Euclid, Book I. Calico Sampler	General Geography of North America	Science	Deductions of Euclid, Book I. Flannel Sampler	Map of Australia	Science	Revise Props. 32 to 48 of Euclid, Book I. Diagram of Chemise	The Solar System	Science	Deductions of Euclid, Book II. Diagram of Night-Shirt	The Tides	Science
SATURDAY	Problems of Motion	Parsing and Analysis	How to teach Arithmetic to Stand. III. / Repetition and Literature	Mensuration of the Circle. Proofs of Arithmetical Rules	Study English Syntax from Text Book	Notes of a Spelling Lesson to Stan. IV. / Any Revision	Mensuration of Parallelograms. Theory of Ratio and Proportion	Music	Study English Accidence from Text Book / Any Geography	Mensuration of Triangles. Problems in L.C.M. and G.C.M.	Paraphrasing and Repetition	Teutonic Roots / Repetition and Literature

SELECTED GOVERNMENT QUESTIONS.

WEEK ENDING 10TH OCTOBER, 1891.

1. Write a letter descriptive of 'The Early Signs of Spring.'

2. Analyse the following passage, and parse the italicised words:—

> And *fast* the faithful clan around him *drew*,
> *What* time the warning note *was* keenly *wound*,
> What time aloft their *kindred* banner flew,
> While clamorous war-pipes yelled the gathering sound,
> And while the Fiery Cross glanced, *like* a meteor *round*.

3. Draw a map of Australia.

4. What is meant by climate? What are the chief causes affecting it? Describe the influence upon it of each.

5. Write full notes of a lesson on 'Multiplication of Fractions.'

6. Point out some of the principal uses of a black-board for teaching arithmetic, geography, and object lessons.

7. Which of our kings were *minors* when they came to the throne? By whom was the Government carried on until they came of age?

8. Describe the reduction of Ireland in the reign of William and Mary.

9. Write *over* each of the following notes its pitch name, *under* it its duration name, and *after* it its corresponding rest:—

(*For Tonic Sol-faists.*) Write *over* each of the following notes its name with regard to its position in the scale (third, fifth, &c.), and *under* it the time name for notes and rests.

10. (*a*) Give an example of inverse proportion, and explain the term *inverse*.

(*b*) How would you explain the fact that in division of decimals the quotient may be larger than the dividend?

11. Find the sum of the four largest and the four smallest numbers that can be expressed by the figures 8259.

38,787 + 10,941 = 49,728. Ans.

12. If I transfer £1,700 from the 3 per cents. at 98 to a 4 per cent. stock at 119 (neglecting brokerage in both cases), find my gain in income.

£5. Ans.

13. (*Men only.*) By what proposition of the First Book is it proved that the area of a triangle whose altitude is a units long and whose base is b units long is $\frac{1}{2}ab$?

> If a straight line be divided into two equal parts, and also into two unequal parts, the rectangle contained by the unequal parts together with the square on the line between the points of section is equal to the square on half the line.

(*Women only.*) Describe the process of cutting-out and making a pinafore for a girl of six years old, with exact measurements, and an account of the materials required.

14. (*Men only.*) Draw the figure required for Euclid I., 47.

> If perpendiculars be drawn from the middle point of the hypotenuse of a right-angled triangle to the two sides, the square on the hypotenuse will be equal to four times the sum of the squares on the two perpendiculars.

(*Women only.*) What are the symptoms, respectively, of measles, small-pox, scarlatina, whooping-cough, and typhus fever? State generally what you believe to be the best precautions and preservatives against infection.

15. (*Men only.*) The sides of a field, A, B, C, D, taken in order are 28, 45, 60 and 57 yards, the angle ABC being a right angle. Find the area of the field in square yards correct to two places of decimals.

2009·85 sq. yds. Ans.

(*Women only.*) Name the materials and the proportional quantities for pea soup.

16. (*Men only.*) Divide $\frac{1}{3}a^3 + \frac{2}{3}a^2x - 2x^3$ by $\frac{1}{3}a + x$.

$a^2 + ax - 2x^2$. Ans.

17. (*Men only.*) Find the G.C.M. of $x^3y + 2x^2y^2 + 2xy^3 + y^4$ and $5x^3 + 10xy^2 + 5x^2y^2$.

$x + y$. Ans.

WEEK ENDING 17TH OCTOBER, 1891.

1. Paraphrase:—

> For who would bear
> The insolence of office and the spurns
> That patient merit of the unworthy takes,
> But that the dread of something after death,
> The undiscovered country from whose bourn
> No traveller returns, puzzles the will
> And makes us rather bear those ills we have
> Than fly to others that we know not of.

2. Explain the force of the following affixes:—*-dom*, *-some*, *-less*, *-ible*, and give examples of their use.

3. Describe the western countries of the South American seaboard.

4. Mention any instances of unusually high or frequent tides. What are bores?

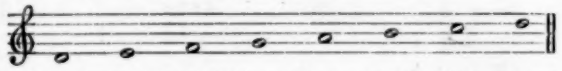
5. In teaching reading to very young children, some teachers begin with the alphabet; and others teach little words first, and afterwards call attention to the names of the separate letters. Which of these methods do you prefer, and why?

6. What sort of objects would you desire to collect in a School Museum? How would you classify and use them?

7. Explain the circumstances which led to the Norman invasion, and give a short account of the Battle of Hastings.

8. What do you know of the Darien scheme?

9. Complete the following as a scale of D or *Re*;—



(*For Tonic Sol-faists.*) Write a scale in the Lah Mode, and one in the Ray Mode.

10. Explain, giving an example of each, the meaning of these arithmetical terms: Multiple, common measure, ratio, proportion, compound, interest, and discount.

11. If I gain 20 per cent, by selling tea at 6s. 8d., how much is gained per cent. by selling it at 7s. 6d.?

35 per cent. Ans.

12. Air is composed of 75·55 per cent. of nitrogen, 23·22 per cent. of oxygen, and 1·23 per cent. of carbonic acid gas. In a chamber containing 6,548 feet, how much is there of each gas?

4947·014 nitrogen + 1520·4456 oxygen + 80·5404 carb. acid gas. Ans.

13. (*Men only.*) What is the axiom on which Euclid bases his reasonings on parallel lines? Is Proposition 17 of the first book the converse of that axiom? If so, is there any objection to the axiom?

Write out Euclid I., 29.

(*Women only.*) State the annual income on which, in your opinion, a retired schoolmistress could live in comfort in her old age; and the methods of saving and investment in her days of full work and salary, by which she could provide that income.

14. (*Men only.*) From the middle point of a side of a right-angled triangle a perpendicular is drawn to the hypotenuse. Show that the difference of the squares on the segments into which it is divided is equal to the square on the other side.

(*Women only.*) Describe the modes of washing, drying, and getting up the different articles which in a labourer's cottage would go into the tub on washing-day.

15. (*Men only*). In a rectangular garden, 40 yards long by 30 wide, a path 5 feet wide is made running round the sides, and there are 4 circular flower beds, each 28 feet in diameter. How much will it cost to cover the rest of the space with grass at 7½d. per square yard?

£22. Ans.

(*Women only.*) Give a sketch of the graduated lessons in needlework, up to Standard III. inclusive, which you would think suitable for children in a mixed school (Girls' or Infants'), the requirements of the Code being fulfilled.

16. (*Men only.*) Prove that $(1 + x)(1 + y) - xy(1 - x)(1 - y)$ contains $1 + xy$ as a factor and find the other factor.

$1 + x + y - xy$. Ans.

17. (*Men only.*) Simplify $\frac{1}{x-1} - \frac{1}{2(x+1)} - \frac{x-3}{2(x^2+1)}$

$\frac{x(3x+1)}{(x^2+1)(x^2-1)}$ Ans.

Week ending 24th October, 1891.

1. State whether the concords in the following sentences are incorrect, and give the proper rule of concord in each case:—

(*a*) Neither she nor James were there.

(*b*) Either Mary or John must fetch me their rake.

(*c*) Scott's 'Tales of a Grandfather' were written for his grandchildren.

2. Give examples of English defective verbs, and show how the deficiencies are supplied.

3. Draw a map of Ireland.

4. Enumerate the productions, imports, and exports of the countries of South America.

5. Describe the sort of apparatus and visible illustration which are likely to prove most helpful to a teacher in giving the earliest lessons in Geography.

6. What rules should be adopted by a teacher in order to keep the schoolroom perfectly (*a*) healthy, (*b*) clean?

7. What events and persons are referred to in the following quotations:—

(*a*) 'Oh, father abbot,
An old man, broken with the storms of state,
Is come to lay his weary bones among ye.'

(*b*) 'From Richard's night to Bolingbroke's fair day.'

(*c*) 'Vane, young in years, but in sage counsel old.'

(*d*) 'Her crew had seen Castile's black fleet.' (*Give dates.*)

8. Give an account of the Chinese wars during the present reign.

9. Write the scale of E major and F minor.

(*For Tonic Sol-faists.*) Describe the mental effects of the seven notes of the scale.

10. A train travelling $33\frac{1}{3}$ miles per hour makes a journey in $2\frac{7}{24}$ hours. In what time would it have traversed the same distance if the speed had been at the rate of $38\frac{1}{2}$ miles an hour?

2 hours. Ans.

11. Show how you would explain to a class of children, by help of an example, '*Carrying in Subtraction.*'

12. If the income tax were $3\frac{1}{2}$ per cent. on a man's income instead of 8d. in the £, what difference would it make on an annual income of £3,125?

£5 4s. 2d. Ans.

13. (*Men only.*) What is the objection to the use of algebraic processes in demonstrating the propositions of the second book.

Write out Euclid II. 13.

(*Women only.*) What kind of a covering for head, body, and feet would you recommend for a damp, cold climate? Give your reasons.

14. (*Men only.*) Write out Euclid I. 26.

A, B, C are three given points. Through A draw a line such that the perpendiculars upon it from B and C may be equal.

(*Women only*). Give the names of six of the most important cooking utensils for a poor man's family, and explain their use.

15. (*Men only.*) A circle and an equilateral triangle have the same perimeter. Compare their areas. $21\sqrt{3} : 22$. Ans.

(*Women only.*) Describe the different methods of darning and the purposes of the stitch, naming the garments and materials on which it is generally used.

16. (*Men only.*) $\frac{3x-1}{7} + \frac{6-x}{4} - \frac{2x-4}{12} = 2 - \frac{x+2}{28}$

$x = 5$. Ans.

17. (*Men only.*) $\frac{x+3y}{4} + \frac{3x+y}{12} = 11$, $x + y = 8(y - x)$ $\Big\}$ $x = 7, y = 9$ Ans.

Week ending 31st October, 1891.

1. Explain the terms reflexive, indefinite, and show in what sense they are applied to some of the parts of speech.

2. Derive the following words:—*compact, arrange, acquaint, algebra, geography, dissuade, abroad, precede, suspend.*

3. What is meant by the terms 'watershed,' 'tributary,' 'affluent,' 'feeder,' 'left bank,' 'bed,' 'fall,' 'volume,' and 'basin'?

4. Where and what are:—Saguenay, Santa Fe, Utah, St. Elias, Hatteras, Coquimbo, Negro, Frio, Jorulla, the Pampas?

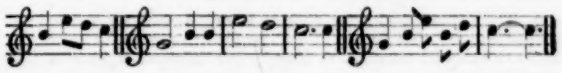
5. What is the best method of examining a class? What kinds of questioning should be avoided?

6. Show by a few illustrative sentences how you would help scholars to determine the case of a Relative Pronoun.

7. Name with dates the principal events connected with Naseby, Derby, Plymouth, Worcester, Canterbury, and Stirling.

8. Write a brief account of one of the great statesmen under the Brunswick dynasty.

9. Write the time signatures of the following:—



(*For Tonic Sol-faists.*) Write the accents for three pulse, four pulse, and six pulse measure.

10. A man bought 240 cows at a foreign port, paying £12 6s. for each, and 128 sheep at £1 17s. 6d. per sheep. Their carriage to London amounted to $\frac{1}{14}$ of the price paid for them. He then exchanged them for 221 ponies, which he sold for £17 per head. What did he gain?

£432. Ans.

11. (*Women only.*) Find by Practice the value of a crop on 15 acres 1 rood $27\frac{1}{2}$ poles at £19 6s. 8d. per acre.

£298 3s. $1\frac{1}{2}$d. Ans.

(*Men only.*) Find the square root of 529·4601. 23·01. Ans.

12. In what time will £3,200 amount to £4,460 at $3\frac{1}{2}$ per cent. per annum, simple interest?

$11\frac{1}{2}$ years. Ans.

13. (*Men only.*) The angles at he base of an isosceles triangle are equal to each other.

A line drawn through the vertex of an isosceles triangle parallel to its base will make equal angles with the two sides of the triangle.

(*Women only.*) State the amount of material required, and the kind of material best suited for making a shirt for a boy of twelve, and give accurate measurements of its different parts.

14. (*Men only.*) Describe a parallelogram equal to a given square and having one of its angles equal to half a right angle.

(*Women only.*) Describe very fully the process of making bread, and the differences of method necessary to suit the kind of oven used in the process.

15. (*Men only.*) The area of a circle is 38·5 square feet. Find the side of a square whose perimeter is equal to the circumference of the circle.

$5\frac{1}{2}$ ft. Ans.

(*Women only.*) On what grounds are the French said to be far in advance of us in regard to the economical preparation of food? Give particulars.

16. (*Men only.*) Solve the equation $\frac{2x-3}{x-2} - \frac{1}{6} + \frac{2x-1}{1-x} = 0$

$x = 4$ or -1. Ans.

17. (*Men only.*) A grocer bought 2 cwt. of sugar at 25s. per cwt. The sugar having been damaged, he sold part of it at 2d. per lb., and the rest at $2\frac{1}{2}$d. per lb., and on the whole transaction he lost $12\frac{1}{2}$ per cent. What weight did he sell at each price?

70 lbs. at 2d. and 154 lbs. at $2\frac{1}{2}$d. Ans.

CORRESPONDENCE.

See end of Certificate article.

ERRATA.

September issue, p. 155, *sum* 5. 16 lbs. of sugar should read 18 lbs., and the answer will work out to 3s. 9d.

Sum 12—in last cancelling, read 19 instead of 9 in numerator, and in middle cancelling of denominator 4 instead of 2. The answer will then be $\frac{1}{19}\frac{3}{3} = 6\frac{1}{10}$ days $= 59\frac{1}{10}$ hrs.

THE 1891 CERTIFICATE EXAMINATION.

BY DR. GEORGE BEACH, M.A.,

Co-Author of 'Our Mother Tongue,' 'Arithmetic for Girls,' Author of 'Elements of English,' 'Entertaining Readers.'

1. Only two months or thereabouts will have expired before the examinations will commence, and if our readers have not by this time completely or nearly covered the whole range of their work there is no hopeful prospect before them.

We trust, however, that none have been so unwise as to procrastinate thus far and to trust to a *final cram*.

2. On the chance that some forgetful ones may be saved, we repeat that applications for a seat at a certificate centre must be forwarded to the Department before the 1st of October.

3. The LITERATURE from 1789 to 1820 is so voluminous that we cannot wonder that many of our pupils are unable to select the likely or essential portions to study. We therefore append a few remarks thereon.

Principal Writers.—Cowper, Chatterton, Burns, Wordsworth, Scott, Coleridge, Southey, Campbell, T. Moore, Byron, Shelley, Robertson, Gibbon, 'Junius,' Paley, Dugald Stewart, Maria Edgeworth, Jane Austen, Lord Jeffrey, Charles Lamb, Boswell, Adam Smith, Jeremy Bentham.

Second-rate Writers.—Percy, Darwin, Sir W. Jones, Sheridan, Crabbe, Hogg, Leigh Hunt, Kirke White, Burke, Mackintosh, John Wesley, Adam Clarke, T. Chalmers, Joseph Priestley, Gilbert White, Henry Mackenzie, Madame D'Arblay, Beckford, 'Monk' Lewis, Horne Tooke, Hannah Moore, Cobbett, Isaac Disraeli.

Third-rate Writers.—Macpherson, Dibdin, Gifford, Rogers, James Montgomery, Hemans, T. Paine, Sharon Turner.

SPECIMEN OF LATIN PARSING AND ANALYSIS.

4. Quod ubi Cæsar resciit, quorum per fines ierant, his, uti conquirerent et reducerent, si sibi purgati esse vellent, imperavit.

[*Re-arranged.*] Ubi Cæsar resciit quod imperavit his, uti conquirerent per quorum fines ierant, et reducerent, si vellent esse purgati sibi.

[*Translation.*] *When Cæsar discovered this he commanded those through whose territories they had gone that [them] they should seek out and should bring back, if they wished to be cleared to him* (*i.e.*, held innocent by him).

quorum—Relative Pron. (*qui, quae, quod*), Plural, 3rd, Common, Genitive, qual. *fines* and agrees with its antecedent *his*.

per—Prep. gov. *fines* in Acc. Case.

uti—Conj., used with Subjunctive, and joins *imperavit* and *conquirerent*, etc.

5. *Permutations and Combinations*—Problems that are partly permutations and partly combinations are commonly propounded; and respecting these there is a great dearth of information and explanation even in the best and most recent Algebras.

The commonest form of these queries is similar to the following:—

Out of 8 consonants and 5 vowels how many words can be made each containing 4 consonants and 3 vowels.

First, the number of combinations of 8 consonants taken 4 at a time $= \frac{8 \times 7 \times 6 \times 5}{4 \times 3 \times 2}$

Second, ,, ,, ,, 5 vowels taken 3 at a time $= \frac{5 \times 4 \times 3}{3 \times 2}$

Third, ,, combinations of the consonantal groups with the vowel groups $= \frac{8 \times 7 \times 6 \times 5 \times 5 \times 4 \times 3}{4 \times 3 \times 2 \times 3 \times 2}$

Fourthly, ,, permutations of each of these groups of 7 letters

$$= \frac{8 \times 7 \times 6 \times 5 \times 5 \times 4 \times 3}{4 \times 3 \times 2 \times 3 \times 2} \times \lfloor 7$$

$$= \frac{8 \times 7 \times 6 \times 5 \times 5 \times 4 \times 3 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2}{4 \times 3 \times 2 \times 3 \times 2}$$

$$= \underline{3,528,000}. \text{ Ans.}$$

ANOTHER METHOD.

First, the number of permutations of 8 consonants taken 4 at a time $= 8 \times 7 \times 6 \times 5$

Second, ,, ,, ,, ,, 5 vowels taken 3 at a time $= 5 \times 4 \times 3$

Third, ,, ,, ,, ,, these groups of 7 letters $8 \times 7 \times 6 \times 5 \times 5 \times 4 \times 3 \times \lfloor 7$

But (1) the permutations of every 4 consonants have been taken twice over, viz., in steps *First* and *Third*, therefore the Third result must be divided by $\lfloor 4$.

Also (2) the permutations of every 3 vowels have been taken twice over, viz., in steps *Second* and *Third*, therefore the Third result must also be divided by $\lfloor 3$.

Fourth, the required number of words

$$= \frac{8 \times 7 \times 6 \times 5 \times 5 \times 4 \times 3 \times \lfloor 7}{\lfloor 4 \times \lfloor 3}$$

$$= \underline{3,528,000}. \text{ Ans. as before.}$$

That the problem is not solely one of *combinations* is evident from a familiar instance, *e.g.*, the words *tea, ate, eat* are *three* words, but only *one* combination.

Of course the mathematical answer is by no means the true one, as multitudinous groups are formed which are phonetically impossible.

SENTENCE.	KIND OF SENTENCE.	SUBJECT.		PREDICATE.		OBJECT.	
		SIMPLE.	EXTENSION.	SIMPLE.	EXTENSION.	SIMPLE.	EXTENSION.
(*a*) Ubi Cæsar resciit imperavit..... .....purgati sibi	Principal	[in verb]		imperavit	ubi Cæsar resciit quod	(1) his (Indircet) (2) uti conquirerent, etc.	per quorum fines ierant... si vellent esse purgati sibi
(*b*) Cæsar resciit quod	Adv. to imperavit	Cæsar		resciit		quod	
(*c*) per quorum fines lerant	Adjective to his	[in verb]		lerant	per quorum fines		
(*d*) uti conquirerent, etc.	Noun to imperavit	[in verb]		conquirerent, etc.		[eos]	
(*e*) si vellent esse purgati	Adverb to conquirerent	[in verb]		vellent		esse purgati sibi	

Cæsar—Prop. Noun, 3rd Decl. (*Cæsar, -aris*), Sing. 3rd, Masc., Nom., Subj. to *resciit*.

resciit—Verb, 3rd Conj. (*re scisco, -ivi* or *ii, itum*), Trans., Act., Indic, Perfect, Sing., 3rd, agrees with its Subj. *Cæsar* and governs *quod*.

CERTIFICATE ROUTINE FOR OCTOBER, 1891 (MEN AND WOMEN, FIRST YEAR).

DAYS	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	Notes of a Spelling Lesson to Standard III.	Read Pacon's Essays 1, 2, 4, 5, 9, 11, 14 to 16, *or* Tennyson	Euclid, Book III., Props. 8 to 15, *or* Repairing Underclothing	Rewards and Punishments	Language of the Arthurian Poems	Euclid, Book III. Props. 16 to 24, *or* Diagram of a Pair of Drawers	Sequence of Intellectual Development	Analyse Lines 192 to 205 of 'Coming of Arthur' and Parse difficult words	Euclid, Book III., Props. 25 to 31, *or* Any Needlework	The range of the Teacher's Influence	Analyse and Parse from Essay XI., *or* Lines 309 to 321 of 'Coming of Arthur'	Euclid, Book I., Props. 1 to 26, *or* Questions on Needlework
TUESDAY	Chief Dates from 1688 to 1727	Division into Proportional Parts	Recent Extensions of British Territory in Africa	Chief Dates from 1727 to 1820	Mensuration of the Circle *or* Vulgar Fractions	Geography of Egypt and Nubia	The Wars of the Roses	Discount, *or* Decimals	The Barbary States	Colonial Development	Division into Proportional Parts	Geography of Western Africa
WEDNESDAY	Fractions and Surds of Algebra, *or* Composition of Food	History from 1688 to 1727	General Principles of Teaching	Measures and Multiples of Algebra, *or* Functions of Food	Cube Root, *or* Theory of Repeaters	Study Grammar from Text Book	Ratio, Proportion, and Variation of Algebra, *or* Organs of Digestion	Square Root, *or* Simple Interest	Euclid, Book II., *or* Cutting out of a Woman's Chemise	Arithmetical Progression, *or* Care of Clothing	Mensuration of Triangles, *or* Compound Interest	Geography of Eastern Africa
THURSDAY	History from 1802 to 1808, *or* Revision	Geometrical Progression, *or* Nutritive Value of Food	Map of Egypt	History from 1727 to 1820	Harmonical Progression, *or* Organs of Mastication	Geography of Egypt, Nubia, and the Soudan	History from 1808 to 1812, *or* Revision	Problems involving Simple Equations, *or* Materials of Clothing	Political Map of Africa	Constitutional History	Problems involving Quadratics, *or* Use of Clothing	Geography of the Congo Free State
FRIDAY	Any Revision	Deductions on Euclid, Book I., *or* Diagram of a Pair of Drawers	Analyse Lines 335 to 343 of 'Passing of Arthur' and Parse difficult words	Most important laws of the Period	Deductions on Euclid, Book II., *or* Cutting out of a Woman's Chemise	Write a Life of Tennyson	Any Revision	Deductions on Euclid, Book III., *or* Any Needlework	State what you know of the origin of the Arthurian legends	Compound Interest	Any Revision	Describe the poetical structure of the Arthurian Poems
SATURDAY	How to teach Arithmetic	Repetition, Penmanship, etc.	Music. — Musical Terms	How to train the Hand	Repetition, Penmanship, etc.	Music. — Musical Rudiments	Notes of a Lesson on Freehand Drawing to Standard IV.	Repetition, Penmanship, etc.	Music. — Major Scales, *or* Chordal structure of the Major Scale and Mental effects of the Notes	How to teach Grammar, *or* 'Form'	Repetition, Penmanship, etc.	Music. — Diatonic Intervals
	Examination			Examination			Examination			Examination		

CERTIFICATE ROUTINE FOR OCTOBER, 1891 (MEN AND WOMEN, SECOND YEAR).

DAYS	FIRST WEEK			SECOND WEEK			THIRD WEEK			FOURTH WEEK		
	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.
MONDAY	The Processes of Reasoning	Study Bacon's Essays, Nos. 11, 14, 16, 18, 19	Euclid, Book VI., Props. 3, A, 4, *or* Tucking and Marking with Cross-Stitch	Health of Teachers and Scholars	Analyse (and parse difficult words) from Bacon's 25th Essay, *or* Lines 58 to 66 of Scene 3, Act III., King John	Euclid, Book VI., Props. 5, 6, 7, *or* Diagram of a Woman's Night-dress	Spencer *or* Locke	Study Bacon's Essays, Nos. 21, 24, 25, 27 to 30	Euclid, Book III., *or* Hedge-tear and Cross-cut Darns	The Half-Time Register and 'Form IX.'	Paraphrase from Bacon's 19th Essay, *or* Lines 44 to 60 of Scene IV., Act III., of King John	Euclid, Book VI., Props. 11, 12, 13, 14, *or* Write down directions for making a Woman's Night-dress
TUESDAY	Dates from 1688 to 1727, *or* Chief Treaties from 1789 to 1820	Continued Fractions, *or* Stocks	As in First Year, *or* General Political Geography of Mexico	Dates from 1727 to 1820, *or* Literature from 1789 to 1820	Discount	As in First Year, *or* Geography of Prince Edward and Cape Bretons Islands, Labrador, &c.	Dates Revised from 1789 to 1820	Stocks	As in First Year, *or* Physical Geography of Canada	Colonial Affairs from 1789 to 1820	Proofs of Fractional Operations	As in First Year, *or* Physical Geography of Canada
WEDNESDAY	Any Revision	Binomial Theorem, *or* Bread and Paste Making	Formation of Habits and Character	Logarithms, *or* Puddings for the Sick	Any Revision	Paraphrase Lines 226 to 238 of Scene I., Act III., King John	Interest (Algebra), *or* How to detect Food Adulteration	Algebraic Arithmetic, *or* A Schoolmistress' Expenditure	Interest (Algebra), *or* Investments	Any Revision	Binomial Theorem, *or* Economy of Food	As in First Year, *or* Geography of Eastern United States
THURSDAY	History from 1802 to 1808	Problems on the work of Mixed Agents	As in First Year, *or* Map of Nova Scotia and New Brunswick	History from 1688 to 1727, *or* Lives of Great Men	Equation of Payments	As in First Year, *or* Geography of Central America	History from 1727 to 1760, *or* from 1802 to 1808	Averages	Indian Affairs from 1789 to 1820	As in First Year, *or* Map of Manitoba	Surds, *or* Compound Proportion	As in First Year, *or* Geography of Southern United States
FRIDAY	Binomial Theorem, *or* Diet for Convalescents	Deductions upon Euclid, Book IV., *or* Diagram of a Woman's Night-dress	Composition upon 'A lie faces God and shrinks from man'	Logarithms, *or* Proper Seasons for the various Meats	Euclid, Book VI., Props. 8, 9, 10, *or* Cutting-out of a Child's Muslin Pinafore	Contents of King John to end of Scene I., Act IV.	Permutations and Combinations, *or* The Ordinary Beverages	Definitions of Euclid, Book V., *or* Making of a Child's Muslin Pinafore	Analyse (and parse difficult words of) Lines 60 to 70 of Scene I., Act IV., King John	Interest and Annuities, *or* Symptoms of the Ordinary Diseases	Euclid, Book VI., Props. 15, 16, 17, *or* Making of a Child's Muslin Pinafore	Revise King John, *or* Bacon's Essays
SATURDAY	School Premises. — Ventilation and Water Supply	Repetition, Penmanship, &c.	Music. — Musical Terms	Examination	Notes of a Lesson on Simple Analysis to Standard V., *or* On the Square, for Infants	Repetition, Penmanship, &c.	Music. — Musical Rudiments	Examination	Rewards, Punishments, Emulation, and Example	Repetition, Penmanship, &c.	Music. — Major Scales, *or* Major and Minor Modes	Examination	The Processes of Reasoning	Repetition, Penmanship, &c.	Music. — Diatonic Intervals, *or* Names of Chromatic Tones	Examination

QUESTIONS FOR FIRST YEAR.

First Week.

1. (*a*) If the school attendance is irregular, describe in what form you could, from the Registers, draw up a statement to put this irregularity in a striking light? (*b*) How do you find the average number of times attended per week by each child present at all? Of what use is this number? (*c*) How would you record punctual attendance? (*d*) Why would you write up the daily attendance in view of the school?

2. What are the three conditions which are laid down in the Education Code, to be fulfilled in an infant school or class? Of all these which seems to you the most important, and why?

3. Write a short life of Lord Tennyson.

4. (*Men only.*) What do the following passages mean:—(*a*) 'Cum non sis qui fueris, non esse cur velis vivere.' (*b*) 'Illi mors gravis incubat, qui notus nimis ignotus moritur sibi.' (*c*) 'Et conversus Deus, ut aspicerat opera, quæ fecerunt manus suæ, vidit quod omnia essent bona nimis.' (*d*) 'Omnium consensu capax imperii, nisi imperassent.'

(*Women only.*) Who were Adam Smith, 'Tetty,' Osborne, Richardson, Cibber, and Wilkes?

5. Very briefly describe the Mahometan States of Africa, giving their area, population, and chief productions.

6. Describe Cape Colony, referring briefly to each of the following points:—When discovered, and how then named—boundaries—capes and bays—mountains—climate—minerals—chief rural industry—animals.

7. Describe shortly the circumstances which tended to strengthen the position of James II. at the beginning of his reign. Name the principal acts by which he lost that position, and show how the *Declaration of Right* prevented the recurrence of such conduct.

8. What part was taken in the history of the Church in England by Wickliff, Thomas Cromwell, Cranmer, Laud, Wesley. When did the terms 'High Church' and 'Low Church' come into use, and what did they then mean?

9. (*Men only.*) Enumerate, giving chief incidents, any wars against or treaties with Spain from 1789 to 1820.

10. What is the least number which when divided by 33 leaves 32 remainder, when divided by 37 leaves 36 remainder, and when divided by 43 leaves 42 remainder? Explain the process of working.

52,502. Ans.

11. (*Men only.*) A shilling weighs 3 dwts. 15 grs., of which 3 parts in 40 are alloy, and the rest pure silver. If the value of pure silver rises 8 per cent., what must be the reduction of pure silver in a shilling? $5\frac{17}{140}$ grs. Ans.

12. (*Women only.*) A man went to market and spent £200. He bought 200 animals, consisting of sheep, pigs and young geese. For each sheep he gave £5, for each pig £1, and for each goose 1s., How many of each did he buy?

38 sheep, 2 pigs, 160 geese. Ans.

13. (*Men only.*) Find the square root of:—

$$16x^6 - 24x^5 + 33x^4 - 50x^3 + 33x^2 - 24x + 16.$$

$4x^3 - 3x^2 + 3x - 4$. Ans.

14. (*Men only.*) Prove that

$$\left(\frac{2x}{a-b} - 1\right)^2 + (1 - b^2)\left\{\left(\frac{2}{a-b}\right)^2 - 1\right\} \text{ is a perfect square.}$$

15. (*Men only.*) The angle at the centre of a circle is double of the angle at the circumference on the same base, that is on the same arc.

GH and KL are two chords in a circle which intersect, when produced, in the point O without the circle; prove that the difference of the angles subtended at the centre by the arcs GK and HL is double of the angle GOK.

16. (*Men only.*) If a straight line touch a circle, and from the point of contact a straight line be drawn cutting the circle, the angles which this line makes with the line touching the circle shall be equal to the angles which are in the alternate segment.

State and demonstrate the converse of this proposition.

17. (*Women only.*) When and how does air cease to be fresh? Explain clearly the effects of a poisoned atmosphere.

18. (*Women only.*) What are the component gaseous elements in water, and in what proportions are they mixed?

19. (*Women only.*) Cut out and make up an infant's first shirt (lined paper).

20. (*Women only.*) To what extent should 'cutting out' be carried on in a girls' school. What time should be given to this portion of industrial work, and what to needlework?

Second Week.

1. Describe fully the process which goes on when we *perceive* an object, and explain as to a class of Sixth Standard children the nature and structure of the organ of sight.

2. In teaching History what use do you propose to make of dates? Explain how you would teach Chronology; how much of it ought to be taught; and what mistakes are often made in teaching it.

3. (*Women only.*) Sketch in moderate detail the life of Dr. Johnson.

(*Men only.*) What are Bacon's views about *Atheism*?

4. Paraphrase Lines 394 to 406 of Passing of Arthur.

5. Draw a map of Africa, marking in the productions and races.

6. Explain why in the belts between the tropics the sun appears vertical in the sky twice a year. Why does not an accurate clock always indicate twelve when the sun is on the meridian? Why are three of the leap years common years in each cycle of 400 years?

7. In what way was the power of the nobles affected by the Crusades, the Wars of the Roses, and the Reformation?

8. When, between whom, and with what immediate results were the following battles fought:—The *Standard*, *Bosworth*, *Worcester*, *Sedgmoor*, *Plassy*, *Vittoria*?

9. (*Men only.*) What is meant by the maxim, 'The King can do no wrong?' How can Ministers be punished? Give instances of such punishment.

10. The sum which will pay A's wages for $61\frac{1}{2}$ days will pay B's wages for $81\frac{3}{4}$ days. For how many days will it pay the wages of both A and B?

35. Ans.

11. (*Men only.*) If A can give B 20 points in a game of 100 points, and B can give C 25 in a similar game, how many can A give C?

40. Ans.

12. (*Women only.*) A person pays £43 17s. 1d. less income tax when the tax is 3d. in the £ than when it is 7d. What is his income?

£2,631 5s. Ans.

13. (*Men only.*) Solve the equations—

(1) $\frac{a}{x-a} + \frac{b}{x-b} = \frac{a+b}{x-a-b}$. $x = \frac{a+b}{2}$. Ans.

(2) $\frac{1}{x^2-1} - \frac{1}{1-x} = \frac{3}{8}\frac{1}{x+1}$. $x = 3$ or $-\frac{1}{3}$. Ans.

14. (*Men only.*) A number (n) is divided into three parts such that one-third of the number exceeds the first part as much as the second part exceeds one-fourth of the number. Find the third part.

$\frac{5}{12}n$. Ans.

15. (*Men only.*) If a straight line touch a circle, the straight line drawn from the centre to the point of contact shall be perpendicular to the line touching the circle. Describe a circle which shall touch a given circle at a given point, and shall also touch a given straight line.

16. (*Men only.*) Enunciate propositions 12 and 13 of the second book, and by means of them prove the following theorem:—

> In every triangle the sum of the squares on two of the sides is equal to twice the square on half the base together with twice the square on the line drawn from the vertex to the middle point of the base.

17. (*Women only.*) Name all necessary apparatus and appliances for (*a*) laundry work, (*b*) simple cookery, and (*c*) fire-place cleaning.

18. (*Women only.*) If a family can afford meat only twice a week, what is the best and most economical food to be recommended on other days?

19. (*Women only.*) Cut out, in paper, the upper part of half the front and half the back of a woman's chemise and fix them together.

20. (*Women only.*) Show in the foregoing exercise—hemming, sewing and felling, gathering, stroking, and setting-in, running tucks and stitching.

Third Week.

1. Give examples of the *inductive method* of treating a lesson, and illustrate your answer by notes on one of these subjects—(*a*) a Transitive Verb, (*b*) the measurements of surfaces, (*c*) Colours.

2. Name those subjects in a school course which are valuable respectively, (*a*) as useful information, (*b*) as practically serviceable in the business of life, (*c*) as instruments of mental development, and (*d*) as helping in the formation of tastes and character. Give reasons for your answer.

3. Analyse lines 192 to 201 of 'Passing of Arthur,' and parse the following words:—*so, that, till, therefore, take, Excalibur, for, how, noon, from, clothed, wonderful, holding, like, king.*

4. (*Men only.*) What are the meanings of the following words as used by Bacon:—*about, apposed, brave, capitol, creature, distasted, indifferent, justs, nuil, muniting, poser, zealants.*

(*Women only.*) Give the derivation and meaning of:—*for -why, weird, prone, chanced, heat, fealty, night-mare, wistfully, conceit, chased, lief, courtesy.*

5. How is rain formed? Why is the rainfall on the west coast of Great Britain greater than on the east? Explain why the country on the least of the Western Ghats receives comparatively little rain.

6. Give a short account of African exploration since 1800.

7. Explain the grounds upon which the following persons were put to death:—*Sir Thomas More, Lady Jane Grey, Somerset, Mary Queen of Scots.*

8. Under what circumstances did the following places fall into English hands:—*Calais, Dunkirk, Jamaica, Gibraltar, Minorca?*

9. (*Men only.*) A man commits a crime. What processes are gone through between his apprehension and his punishment?

10. Two pipes turned on together can fill a cistern in 8 minutes, and one of them alone can fill it in 24 minutes. How long would the other alone take?
12 minutes. Ans.

11. (*Men only.*) A man after a tour in Ireland finds that he has spent every day half as many shillings as the total number of days he has been from home. His tour cost £57 12s. How many days long was it?
48 days. Ans.

12. (*Women only.*) The true discount on a certain sum of money due 2½ years hence at 3 per cent. is £17 14s. 6d.; what is the sum?
£254 1s. 2d. Ans.

13. (*Men only.*) Find the sum of n terms of an A.P., of which a is the first term and b the common difference.

Two clerks are engaged at the same time. A chooses a salary of £100 a year, increasing £20 annually. B chooses a salary of £50 per half-year, increasing £5 every half year. Which makes the better bargain, and how much more than the other has he received at the end of 20 years?
B by £100. Ans.

14. (*Men only.*) Investigate a test to determine if three quantities A, B and C are in G.P.

Apply the test to 3½, 2¼, 1⅛, also to 4·5, ·75, ·125.

A G.P. is such that the n^{th} term = the sum of the succeeding terms *ad inf.* Find the common ratio.
½. Ans.

15. (*Men only.*) If a straight line be divided into two parts, the squares on the whole line and on one of the parts are equal to twice the rectangle contained by the whole and that part together with the square on the other part.

In the triangle PQR the angles at Q and R are equal and QS is perpendicular to PR. Show that the square on QR is double the rectangle contained by PR, SR.

16. (*Men only.*) To draw a straight line at right angles to a given straight line from a given point in the same. State the corollary. In what respects is the proof of it not perfectly sound?

17. (*Women only.*) Describe fully with particulars respecting price the outfit suitable for a young girl of 16 going out to service.

18. (*Women only.*) Give clear instructions for making (*a*) a loaf of bread, and (*b*) Irish stew.

19. (*Women only.*) Cut out and fix together a paper pattern of half a pair of drawers, for a child of 5 years of age.

20. (*Women only.*) Fix and work a patch in calico not less than two inches square. Fix a band about two inches long, and on it sew a button and work a button hole.

Fourth Week.

1. In the '*Instructions to Inspectors*' it is said, 'the more thoroughly a teacher is qualified for his position by skill, character, and personal influence, the less necessary it is for him to resort to corporal chastisement.' Discuss this statement, and say what other means are accessible to a teacher for the preservation of good discipline in either (*a*) an infant school, or (*b*) a school for girls.

2. What are the advantages and disadvantages of setting scholars in a class to question one another at the end of a lesson?

3. Paraphrase lines 65 to 74 of 'Passing of Arthur.'

4. Analyse lines 75 to 86 of 'Coming of Arthur,' and parse *passing, thence, desiring, to be joined, as, that, there, lift, up, happiness, vext, stars, hollow, saving, be joined, that, as, nothing.*

5. Draw a general map of British South Africa.

6. How far are the expressions '*temperate flora*,' '*tropical fauna*,' correct, *i.e.*, does identity of latitude with similarity of climate imply agreement in the character of the flora and fauna? Give examples.

7. Name two great navigators, two great writers, and two great statesmen of Elizabeth's reign, and say what they did. State the causes of the war between England and Spain.

8. What were the following:—*Dissolution of the Monasteries, The Six Acts, Pilgrimage of Grace, Acts of Supremacy and Uniformity?*

9. (*Men only.*) What were the following years noted for:—1789, 1798, 1800, 1805, 1815? What were the dates of *Capture of Seringapatam, Battle of Copenhagen, Treaty of Amiens, Battle of Assaye?*

10. What must be the least number of soldiers in a regiment to admit of it being drawn up 2, 3, 4, 5 or 6 deep, and also of it being formed into a solid square?
900. Ans.

11. (*Men only.*) If the length of a square reservoir be 12 ft. 8 in. and 1 c. ft. of water weighs 1,000 ozs., what weight of water must be drawn off that it may sink 3 ft. 9 in.?
16 tons 15 cwt. 3 qrs. 0 lbs. 2⅞ ozs. Ans.

12. (*Women only.*) Find a mean proportional between ·6 and ·024.
·12. Ans.

13. (*Men only.*) If $(a+b+c+d)(a-b-c+d) = (a-b+c-d)(a+b-c-d)$, then $a:b::c:d$.

14. (*Men only.*) Show according to the conditions of the previous question that

$$\frac{1}{ma}+\frac{1}{nb}+\frac{1}{pc}+\frac{1}{qd}=\frac{1}{bc}\left(\frac{a}{q}+\frac{}{p}+\frac{c}{n}+\frac{d}{m}\right)$$

15. (*Men only.*) If two circles touch one another internally, the straight line which joins their centres being produced shall pass through the point of contact.

Prove also that if a straight line be drawn through their point of contact, cutting the circumferences, two radii drawn to the points of intersection are parallel.

16. (*Men only.*) Define *plane superficies, figure, parallelogram.* Distinguish between *axioms* and *postulates.* Name the parts of which every proposition consists.

17. (*Women only.*) Whence do we obtain our supply of the raw material of silk, cotton, wool, and linen? Compare cotton and linen as regards their price, their qualities, and their suitability for use as under garments.

18. (*Women only.*) What is the difference between arterial and venous blood? Explain why the circulation of the blood is needed to maintain the health of the body, and by what habits or acts such circulation is promoted or hindered?

19. (*Women only.*) On a piece of calico (6 × 6 in.) show not less than three inches of the following stitches:—Hemming, sewing, stitching and feather-stitching.

20. (*Women only.*) Darn a hole in stocking-web material (common method).

QUESTIONS FOR SECOND YEAR.

First Week.

1. (*a*) A school has been open 440 times in the year; 35,047 attendances have been made. Find the annual average.

(*b*) Write out the rules to be observed in marking the daily attendance register in case of—(1) absence: (2) a scholar leaving before the expiration of two hours of secular instruction; (3) days set apart for religious inspections.

(*c*) What are the only conditions under which a scholar's name may be removed from the register?

2. Show how a habit of close observation of the distinctive characteristics of objects presented to young children may be most effectually cultivated.

3. *Then* turn your forces from this paltry siege
And stir them *up* against a *mightier* task.
England, *impatient* of your just demands,
Hath *put* himself in arms; the adverse *winds*,
Whose *leisure* I have stayed, have given *him* time
To land his legions *all as soon as I*:
His marches are *expedient* to this town,
His forces strong, his soldiers *confident*.

Analyse the above passage and parse the italicised words.

4. Write a short essay upon '*Discourse ought to be as a field, without coming home to any man.*'

5. } (*Men only.*) As in First Year.
6. }

7. (*Women only.*) Describe the exports and productions of the United States.

8. (*Women only.*) How is the United States governed? What is its commercial policy? Explain and illustrate the statement '*The centre of population is rapidly moving westward.*'

9. (*Men only.*) See Question 7 of First Year.

10. (*Men only.*) See Question 8 of First Year.

11. What great appliances for saving labour were invented between 1789 and 1820?

12. Give dates of Siege of Toulon; the escape from Elba; 'Peterloo;' Battle of New Orleans; Battle of Orthes; Regency of Prince of Wales (George IV.).

13. (*Men only.*) Divide $6x^{\frac{3}{4}} - 96x^{-\frac{1}{4}}$ by $x^{\frac{1}{2}} - 2x^{-\frac{1}{4}}$.

$$\underline{6x + 12x^{\frac{1}{2}} + 24x^{-\frac{1}{4}} + 48x^{-1}}.$$ Ans.

14. (*Men only.*) If $y = \dfrac{1 - \sqrt{1 - x^2}}{1 + \sqrt{1 - x^2}}$, $z = \dfrac{1 - \sqrt{1 - y^2}}{1 + \sqrt{1 - y^2}}$,

prove that $z = \left\{\dfrac{1 - (1 - x^2)^{\frac{1}{2}}}{1 + (1 - x^2)^{\frac{1}{2}}}\right\}^2$.

15. (*Men only.*) Write out Euclid III., 20.

Two equal circles intersect in P, Q. Any straight line is drawn through P meeting the circles again in R, S. Show that if QR and QS be joined QR is = to QS.

16. (*Men only.*) Write out Euclid IV., 15.

Compare the areas of regular hexagons inscribed in and described about a given circle.

17. (*Men only.*) A man bought a horse and carriage for £100, and sold the horse for a gain of 50 per cent. on its prime cost, and the carriage at a loss of 25 per cent., thus gaining 5 per cent. on his whole outlay. Find the buying and selling prices of the horse and carriage respectively. £40, £60, £60, £45. Ans.

18. (*Men only.*) Suppose a circular pipe, the diameter of which is 1½ inches, will fill a tank in five hours, in what time will a similar pipe of 3½ inches diameter fill the same tank? $\frac{4}{7}$ hour. Ans.

19. (*Women only.*) Mention the ordinary causes of the beginning of fevers, and explain the practice of isolating infectious cases.

20. (*Women only.*) To what extent are shell-fish and preserved fruits useful articles of diet.

21. (*Women only.*) If our base of notation were *six* instead of *ten*, how would the number 375 be represented. Write out the numbers from one to fifty expressed as would be in the scale of six.

1,423; 0, 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 15, 20, &c. Ans.

22. (*Women only.*) Define Interest and Present Worth, and calculate the Present Worth of £911 13s. 3d., due five years hence at 3 per cent. simple interest. £792 15s. Ans.

Second Week.

1. How does Herbert Spencer consider that History should be taught? *or*

Criticise Locke's 'Hardening System' as applied to the body.

2. What associations of memory are most active in the case of very young scholars? Show how these may be gradually replaced by higher habits of association under skilled teaching.

3. Paraphrase the following:—

So, in this right hand, whose protection
Is most divinely vowed upon the right
Of him it holds, stands young Plantagenet,
Son to the elder brother of this man,
And king o'er him and all that he enjoys:
For this down-trodden equity we tread
In warlike march these greens before your town,
Being no further enemy to you
Than the constraint of hospitable zeal
In the relief of this oppressed child
Religiously provokes.

4. In what respects does the language of the essay differ from that of the present day?

5. } (*Men only.*) As for First Year.
6. }

7. (*Women only.*) Mention in order of size the twelve most important towns of the United States, giving the occupation of their inhabitants.

8. (*Women only.*) Draw a map of the Mackenzie, especially denoting the system of lakes therewith connected.

9. (*Men only.*) See question 7 of First Year.

10. (*Men only.*) See question 8 of First Year.

11. Mention three poets, three theologians, three novelists, with their principal works, who flourished between 1789 and 1820.

12. Give the dates of capture of Cape Colony; Mutiny of Nore; Capture of Seringapatam; the Six Acts; Napoleon's Invasion of Russia; the Walcheren Expedition.

13. (*Men only.*) Find the sum of a given number of quantities in Arithmetical Progression, the first term and the common difference being given.

If the arithmetical mean between *a* and *b* be twice as great as the geometric mean, find the ratio of *a* to *b*. $\frac{a}{b} = \frac{7 + 4\sqrt{3}}{1}$ Ans.

14. (*Men only.*) The square root of a rational quantity cannot be partly rational and partly a quadratic surd. Find the square root of $10\frac{1}{2} + 2\sqrt{5}$. $\underline{\sqrt{10} + \sqrt{\frac{1}{2}}}$. Ans.

15. (*Men only.*) Write out Euclid II. 13.

The straight line PQ is divided in R, so that the rectangle PQ, QR is = to the square of PR. Circles with centres Q, R, and radii = to PR intersect at S. Show that PQS is an isosceles triangle having each of the angles PQS, PSQ double of QPS.

16. (*Men only.*) Write out Euclid IV. 4.

M is the centre of the circle inscribed on the triangle PQR, and N is the centre of the circle which touches PQ and PR produced and QR. Show that MN is the diameter of a circle which passes through Q and R.

17. (*Men only.*) Simplify $\dfrac{\sqrt{25{\cdot}4016} - \sqrt{1{\cdot}0609}}{\sqrt{25{\cdot}4016} + 1{\cdot}0609}$.

$\frac{401}{607}$ Ans.

18. (*Men only.*) If cloth be bought at 2s. 9d. per yard, find what its selling price must be to leave a profit of 30 per cent. after allowing a discount for cash of sixpence in the £. 3s. 8d. Ans.

19. (*Women only.*) Describe the present facilities for investing small sums of money, mentioning both interest and security. Give instances of investments to be avoided on the ground of risk.

20. (*Women only.*) What portion of income should, as a rule, be spent in house rent? Explain the nature of Building Societies, and of Fire and Life Insurance?

21. (*Women only.*) Find to five decimal places the difference between the square of 8·50163 and the cube of 3·712.

21·13027. Ans.

22. (*Women only.*) By accepting A's offer for land recently purchased I should lose 7 per cent. on the purchase money. By accepting B's offer I should gain 5 per cent. B offers £273 12s. more than A. Find what I paid for the land. £2,280. Ans.

Third Week.

1. What are Herbert Spencer's seven reasons for stating that *scientific knowledge* is of the most worth? *or* What are Locke's ideas about *manual training*?

2. Discuss the advantages and disadvantages of teaching the earlier stages of reading by the *Phonic* method.

3. Explain the following:—a half-faced groat; Good den!; vulgar air; three foot of it; as I have banked their towns; as a form of wax resolveth from his figure 'gainst the fire; absey book.

4. Give the Antitheta of Bacon's Essay XXI. 'On Delays.'

5. } (*Men only.*) As for First Year.
6. }

7. (*Women only.*) Describe the government, population and productions of Mexico.

8. (*Women only.*) What are the principal winds and ocean currents connected with North America?

9. (*Men only.*) See question 7 of First Year.

10. (*Men only.*) See question 8 of First Year.

11. Roughly describe a man-of-war of 1800 and state the strength of our navy during any year from 1795 to 1805.

12. Give dates of Defence of Acre by Sidney Smith; Capture of Malta; Maritime confederacy against England; Battle of Ligny; Battle of Maida; Convention of Cintra.

13. (*Men only.*) If $a : b :: b : c :: c : d$ show that $(b + c)(b + d) = (c + a)(c + d)$.

14. (*Men only.*) The number of combinations of n things taken r at a time = the number of combinations of them taken $(n - r)$ at a time.

The number of permutations of $2n + 1$ things, $(n - 1)$ together: the number of permutations of $2n - 1$ things, n together as 3 : 5. Determine n. $n = 4$. Ans.

15. (*Men only.*) Write out Euclid III., 36.

Two circles intersect in P, Q. If tangents be drawn to the circles from any point R in PQ produced they shall be equal.

16. (*Men only.*) Write out Euclid VI., 2.

MNP, MNQ are equal triangles, MQ and NP intersect in R. Through R a straight line is drawn parallel to MN meeting MP in T and NQ in V. Show that TR is equal to RV.

17. (*Men only.*) A person fills a glass with gin, and then drinks a quarter of it. Then filling up the glass with water he drinks $\frac{1}{3}$ as much as last time. Again filling up the glass he drinks $\frac{1}{3}$ as much as the second time. How much gin does he drink?

$\frac{3}{4}$ of it. Ans.

18. (*Men only.*) I have to be at a certain place at a certain time. If I walk 4 miles an hour I shall be 5 minutes too late, but if at 5 miles per hour 10 minutes too soon. What distance have I to go?

5 miles. Ans.

19. (*Women only.*) Explain these terms—*phosphate, cereal, albumen, leguminous, fibrin* and *casein*, and give examples of their use.

20. (*Women only.*) How are coffee, milk, bread, beer and butter sometimes adulterated, and by what means can such adulteration be most readily detected?

21. (*Women only.*) A man invests a legacy of £3,500, half in the 2½ per cents. at 90, and half in an annuity which brings him in 7 per cent. on his outlay. Find his total income neglecting brokerage. £171 2s. 2·46d.

22. (*Women only.*) The area of an oblong field, whose length is twice its breadth, is 80 acres. Find the length of its sides.

2 furls. and 4 furls. Ans.

Fourth Week.

1. What are the principal objects of the promoters of technical education? How can the habits contemplated be promoted in the lower classes of a school for older children?

2. How is the teaching of Geography promoted, (1) by the use of blank maps, (2) by means of a familiar locality, and (3) by map drawing?

3. Explain the following allusions:—'The awless lion;' 'the outward eye of fickle France;' 'O Lymoges;' 'Play fast and loose;' 'Bell, book, and candle shall not drive me back;' 'Once again crowned.'

4. Draw up a list of twenty words used by Bacon, whose meaning has since been modified.

5. } (*Men only.*) As for First Year.
6. }

7. (*Women only.*) Give a short history of the European colonisation of North America.

8. (*Women only.*) Draw a map of British North America east of the 100° E. meridian.

9. (*Men only.*) See Question 7 of First Year.

10. (*Men only.* See Question 8 of First Year.

11. Mention what (if any) advances were made in the privileges of Parliament and the liberty of the Press from 1789 to 1820.

12. Give dates of Battle of Camperdown; Napoleon declared First Consul; Battle of Alexandria; Bombardment of Algiers; Battles of the Pyrenees; The Berlin Decree.

13. (*Men only.*) Assuming the law of the formation of the terms to hold when $n - 1$, binomial factors, are multiplied together, prove it to hold for n factors and hence derive the Binomial Theorem.

Write down the general term of $\left(3ax - \frac{y}{3a}\right)^n$.

$$\frac{n(n-1)\ldots\ldots(n-r+1)}{\lfloor r} \times 3a^{n-2r} \times x^{n-r} \times -y^r \text{ Ans.}$$

14. (*Men only.*) Prove that $\log \frac{m}{n} = \log m - \log n$, and that $\log m^n = n \log m$. In what time would any sum of money treble itself at 5 per cent. per annum compound interest? Given $\log 2 = \cdot 301{,}030$, $\log 3 = .477{,}121$, $\log 7 = \cdot 845{,}098$. 22½ years. Ans.

15. (*Men only.*) Write out Euclid III., 31.

PQR is a triangle, PS, RT, meeting in V, are drawn perpendicular to the opposite sides. QV is produced to meet PR in W. Show that QW is perpendicular to PR.

16. (*Men only.*) Write out Euclid VI., 15.

Prove that the equilateral triangle described on the hypothenuse of a right-angled triangle is equal to the sum of the equilateral triangles described on the other two sides. (VI., 16) may be used.

17. (*Men only.*) The cost of levelling a square exercise ground is £70, and if each side were 3 ft. longer, the cost would be increased by £7 3s. 6d. Find the length of the side of a square and the cost per square yard. 20 yds., 3s. 6d. per yard. Ans.

18. (*Men only.*) A can copy 6 pages while B copies 5, B copies 5 pages while C copies 4, C copies 4 pages while D copies 3. A can write 20 pages a day, and receives 12 days' work to do, but after working 3 days he gets B, C, and D to assist him. When will it be finished? 6 days from start. Ans.

11. (*Women only.*) What causes the prices of meat, fish, and vegetables to vary at different periods of the year? Give some instances showing at what times it is advantageous and when it is disadvantageous to purchase particular articles.

20. (*Women only.*) Give a recipe for making barley-water, and say when, and in what sort of illnesses, it is most useful?

21. (*Women only.*) Two partners start in business, one with £2,500 and the other with £1,500, and borrow £1,200 at 4 per cent. At the end of a year they have gained a profit of 10 per cent. on the whole capital. What should each receive in proportion to his capital? £295; £177. Ans.

22. An old lady went to market and bought on Monday 5 calves, 4 sheep, and 3 pigs for £50. On Tuesday she purchased 6 calves, 5 sheep, 4 pigs for £62, and on Wednesday 7 calves, 6 sheep, and 6 pigs for £77. On each day the prices for the same animals were the same. What did she pay for each one of each kind?

£5 per calf, £4 per sheep, £3 per pig. Ans.

CORRESPONDENCE.

We shall be pleased to reply briefly and through this column to any seeking information and advice.

Replies demanding urgency will be promptly forwarded per post on receipt of stamped and addressed envelope. A post will be saved by writing direct to Dr. George Beach, M.A., Stanley Mount, Macclesfield.

This privilege does not of course extend to furnishing the solution and answers of problems.

Studile, Constant, John, E. J. W. B.—'A Short Geography of Africa,' by Johnston and Ravenstein, published by E. Stanford, Charing Cross. Price one shilling.

Lucus (Kent).—Your case is a hard one. If you had been a member of the N.U.T. moral pressure would have been brought to bear, and possibly a question been asked in the House. Get the parents on your side. You will see that we have also written to you *in extenso*.

STUPID (Greenlands).—(1) An almost exactly similar problem is worked in full in our last month's issue, p. 153. (2) Write to Spottiswoode and Co.

J. M. (Douglas).—If you succeed you can try as many times as you like.

COUNTRY BUMPKIN (Essex).—*Every* name must now be entered on the Drawing Schedule, if the scholar were only admitted the day previous. We agree with you that this is unjust, as the schedule does not require the number of times attended. Endorse the drawing paper worked upon and sent up.

JOHN D— (Gateshead).—We believe that a slope of the writing *in the direction that the hand travels* is more natural than the upright style.

F. M. N. (Castor).—You will be allowed marks both at the Scholarship and Certificate.

K. D. F. (Amesbury).—Our reading of sum No. 8 (*b*), Males, was correct.

R. W. McL. (Callernish, Stornoway).—Will you kindly repeat your question, as we cannot accurately gather its meaning?

H. W. H. (Milford Haven). No recitation is required; but the Education Department will readily give you an authoritative answer.

M. E. J. (Rhymney), DOT (Newport), S. N. (Buxton), A. M. F. (Berkhamstead), S. O. N. (Walsall), TRY (Swansea), F. W. N. (Ashford), J. J. (Maidstone), NAVY (Portsmouth), E. T. P. (Brightlingsea), L. A. (Macclesfield), J. U. (Edgbaston), G. W. S. (Lâxey), O'CONNOR (Flint), W. W. (Brighton), W. W. (Clough), T. O. P. (South Shields), R. N. (Stoke), J. C. (Cragstone), S. H. (Hartlepool), UNIT (Ashbourne), J. S. (Seaton Burn), ONE AND ALL (Camborne), H. M. (Waterhead), G. W. (Chester), T. C. (Neath), J. A. T. (Uxbridge Common), A. H. (Training College), A. S. (Tranmere), R. W. D. (Foulby), F. D. (Barrow-in-F.), W. B. W. (Sandhurst), J. N. (Sudbury), W. C. (Bournemouth), C. H. H. (Bermondsey), answered per ordinary letter.

(To be continued.)

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LONDON MATRICULATION.

JANUARY, 1892.

OUR PREPARATION CLASS FOR PRIVATE STUDENTS.

BY T. RUSSELL MALTBY, M.A. (CLASSICAL HONOURS),

Kingswood School, Bath.

(FOURTH MONTH.)

OUR readers will find it of great advantage, we believe, to compare the answers which we advised them to write *under examination conditions* with those published in the November No. of *The Practical Teacher*. It is to be noticed that *all* the questions are answered in every paper, although in many cases the actual candidate would be limited to a certain number of the whole. We feel bound to add, by way of encouragement, that 'model answers' to some of the papers are physically impossible in the examination. We question whether a 'model' candidate could have gained the maximum of marks in the Latin and French papers set last time. In some papers, notoriously the *Heat and Light*, we consider there were questions quite outside the limits determined by the University Regulations. This month we present simply a scheme of work in our class-subjects; in our November number we hope to give *notes on the September and on the October work*.

Scheme of Work for October.

I. LATIN.

1. *Allen's Grammar, Sects. 164 to 183, 185 to 194, 196 to 199, 209 to 239.*—Numerals, relative, interrogative, and indefinite pronouns, terminations of derived nouns, Roman weights and money, grammatical terms, laws of quantity, parsing, classification of the uses of the subjunctive, examples on the three concords.

2. *Allcroft and Haydon, Sects. 152 to 211.*—Many of these sections will supplement the grammar work for the month.

3. *Allcroft and Haydon, Exercises VIII., IX., X. and XI.*—135 sentences.

4. *De Bello Gallico, V., Chapter 40 to the end.*

5. *De Bello Gallico, VI., Colbeck's Introduction.*

6. *Translation at Sight.*—Regular practice (written).

II. GREEK.

1. *Abbott and Mansfield's Grammar, Sects. 155, 156, 158 to 162, 163 to 165.* (Irregular verbs.)—This is a small amount for one month's work, but the sections are difficult and essential.

2. *Odyssey IV., 332—491.*

3. *Translation at Sight.*—Regular practice.

FRENCH.

1. *Breymann's Grammar, Chapters II. and III.*—Articles and nouns.

2. *Matriculation French Papers, XII. to XV.*—Written translation.

3. *Rapid Translation*, as before.

4. *Word-lists and Phrase-lists*, as before.

III. ENGLISH.

1. *Beach, pp. 161 to 177, 180 to 187, 196 to 202.*—Punctuation, figures of speech, history of the language, periods of English, derivation and composition, prefixes, Teutonic roots, affixes.

2. *Prosody.*—Continued practice.

3. *English History, 1603 to 1702, with the Geography relating thereto.*

IV. MATHEMATICS.

1. *Arithmetic.—Capel's Handbook, Part VI.* Miscellaneous subjects, including exchange and chain rules, square and cube root.

2. *Algebra.—Capel's Handbook, Chapters XXIX. to XXXIV.* Simultaneous and quadratic equations.

3. *Geometry.—Hall and Stevens' Euclid, pp. 144 to 148* (theorems and examples on Book II.), *and pp. 184 to 214* (Book III. from Prop. 20, with exercises).

V. MECHANICS.

Magnus, Statics, Chapter VII.—Theory of equilibrium.

VI. CHEMISTRY.

Morris's Class Book, pp. 67 to 89.—Sulphur, Sulphur Dioxide, Sulphuric Acid, Sulphuretted Hydrogen, Silicon, Phosphorus, Phosphoric Anhydride, Phosphoric Acid.

HEAT AND LIGHT.

Wallace Stewart, Light, Chapters I. to IV.—Introductory, rectilinear propagation of light, photometry, reflexion at plane surfaces, reflexion at spherical surfaces.

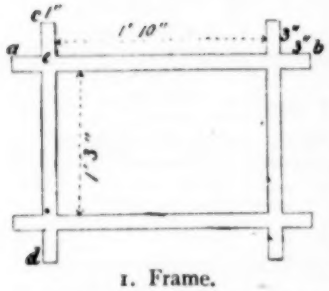
TEACHERS' NOTES OF DRAWING LESSONS FOR STANDARD IV.

By E. BUFFERY-RIDGE,

Art Master, London School Board.

Drawing to Scale.—Standard IV.

On Squared Paper.

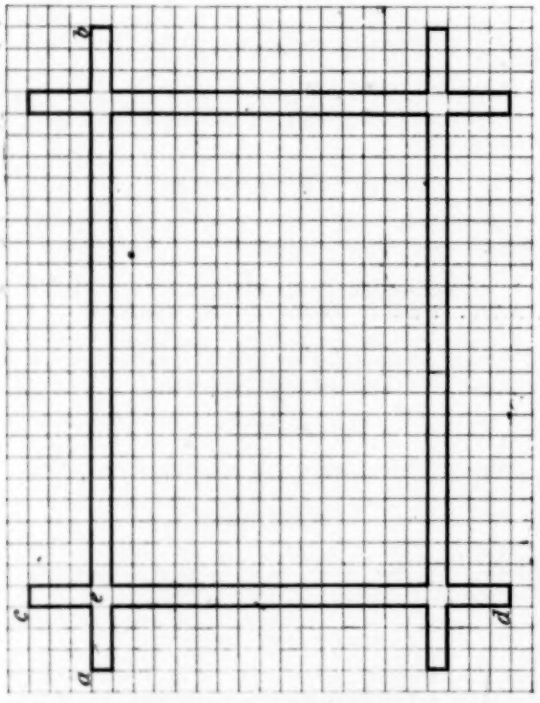


1. Frame.

This drawing of an Oxford frame is rough, and its measurements are not exact, but the true size of the frame itself is marked on the drawing. Draw the frame on the squared paper, supposing *each square* to represent a measurement of *one inch* across it. The drawing will then be exactly one-eighth of the size of the frame, because the squares really measure one-eighth of an inch across.

The mark ' stands for feet, " stands for inches, thus 3' 9" = 3 ft. 9 in. or 45 inches, and would reach as far as 45 squares.

A dotted line with an arrow on each end shows that the measurement along it is from the places where its ends reach to.



Take care to *count the square spaces, not the lines.*

Count, and mark the place, before ruling.

Draw the longest lines first if you can.

With the square-lines to go by there is no need to rule across empty places such as *e*.

Measurements.		Inches.		Squares.
1' 10"	=	22	=	22
1' 3"	=	15	=	15
3"	=	3	=	3
1"	=	1	=	1

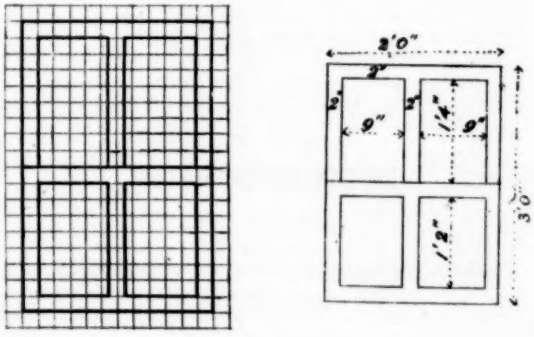
To draw from a to b, taking care to leave room for c above.

Put a dot at *a*, count 3 squares, put a dot, miss one square, dot, count 22, dot, miss one, dot, count 3, dot.

Rule 3, *miss* 1, rule 22, *miss* 1, rule 3, being guided by the dots, which should be *small enough to be hidden by the line*, not large like those in this drawing.

Next take the line *cd*, counting 3 squares upwards from *e* and the rest downwards. Rule the line, missing the empty squares as before.

When these two lines are right there is not much chance of the others being wrong. Of course the two sides will be alike, also the two ends, and the four corners.

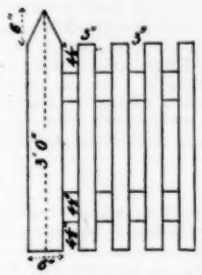


2. Window. 1 sq. = 2"

One square stands for 2 inches. One inch takes *half a square*. Notice the 'meeting bars' across the middle of the window. You see only one in the drawing—look at a real window of the same sort to see why.

Measurements.		Inches.		Squares.
3' 0"	=	36	=	18
2' 0"	=	24	=	12
1' 4"	=	16	=	8
1' 2"	=	14	=	7
9"	=	9	=	4½
2"	=	2	=	1

Draw the four outside lines, then the line across the middle, then the inside lines. Guess the half squares for the middle upright lines.

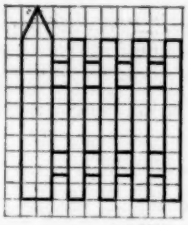


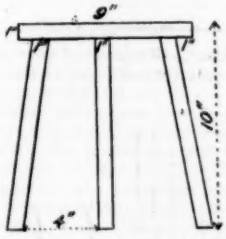
One square = 3 inches.

Measurements.		Inches.		Squares.
3′ 0″	=	36	=	12
6″	=	6	=	2
4½″	=	4½	=	1½
3″	=	3	=	1

Draw all the upright lines first, then the top and bottom lines to finish the upright parts of the gate. Count 1½ squares twice from the top of the rails and twice from the bottom, and draw the lines in the spaces between the uprights.

3. Gate. 1 sq. = 3″



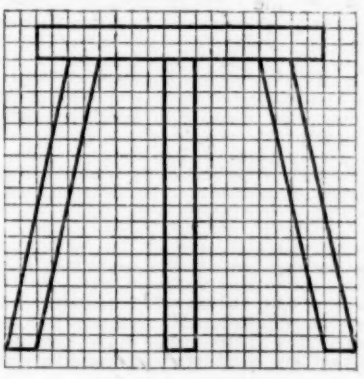


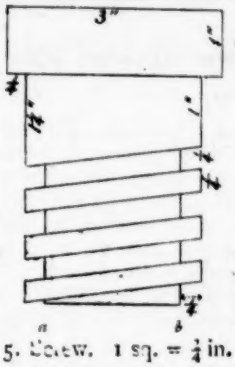
4. Stool. 1 sq. = ½ inch.

One square = ½ inch. One inch takes two squares.

Measurements.		Inches.		Squares.
10″	=	10	=	20
9″	=	9	=	18
4″	=	4	=	8
1″	=	1	=	2

Draw the top, then the middle leg; mark dots for the side legs and see that they are both alike before ruling the lines. How far between the tops of the legs?



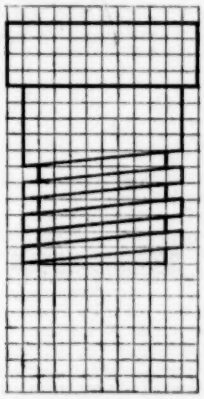


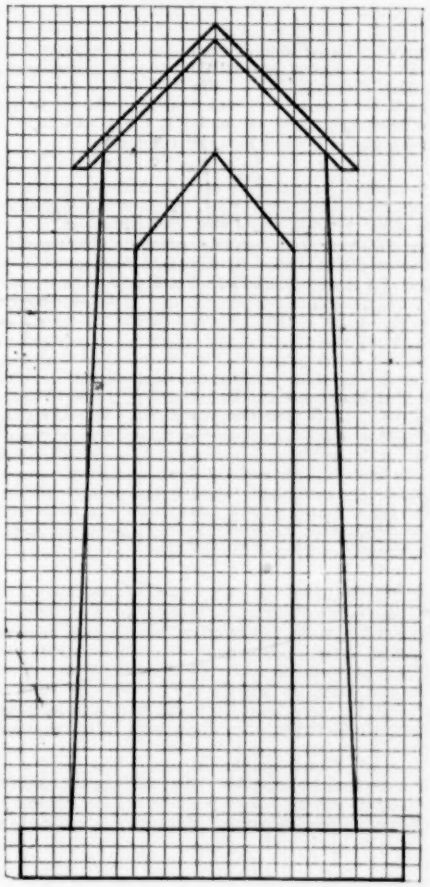
One square = ¼ inch. One inch takes 4 squares.

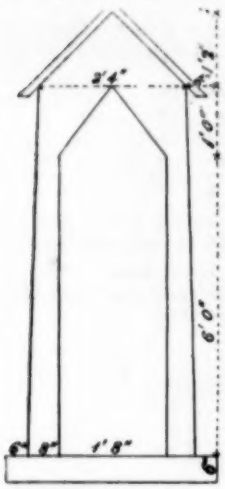
Inches.		Squares.
3	=	12
1¼	=	5
1	=	4
¼	=	1

Draw the top part, then the upright lines *at the sides*, then the slanting lines, but *be sure to leave the upright short lines above a and b till last.*

5. Screw. 1 sq. = ¼ in.







One square stands for 2 inches.

Begin at the bottom. The slanting roof is to project 4 inches beyond the top of the slanting side. When the sides are ready draw the under lines of the roof, then the top lines so as to be two squares wider on each side than the tops of the sides, then short horizontal lines one square long to finish. Find the length of the base line by adding up

1′ 8″ + 6″ + 8″ + 6″ + 8″
Doorway Left side Right side

6. Sentry box. 1 sq. = 2″

(To be continued.)

SCIENCE NOTES.

THE MEETING OF THE BRITISH ASSOCIATION AT CARDIFF.—The meeting of the British Association at Cardiff, if neither so important nor so interesting as the meeting of the Association last year at Leeds, had nevertheless some interesting features. Dr. Huggins, in his presidential address, gave a most instructive account of the great advances Astronomical Science has made during the last thirty years. The vexed question of 'thought transference' was dealt with by that distinguished Physicist, Professor Lodge; Professor Roberts-Austen forecast the future of Metallurgy, and two ladies, Mrs. Bishop (Miss Isabella Bird), whose travels in the East have made her famous, and Mrs. Sheldon, followed in the footsteps of Miss Muriel Dowie by recounting to the Association their respective adventures in Central Asia and Kilmanjaro.

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A PHOTOGRAPHIC CHART OF THE HEAVENS.—It was at the International Conference of Astronomers at Paris, in 1887, that the project of an International Chart of the Heavens took its origin. The present year has seen its practical commencement. The decisions of the conference in their final form provide for the construction of a chart which it is expected will reach down to stars of about the fourteenth magnitude. As each plate is to be limited to four square degrees, and as each star, to avoid possible errors, is to appear on two plates, over 22,000 photographs will be required. This great work will be divided according to their latitudes among eighteen observatories provided with similar instruments. Those in the British Dominions have been constructed by Sir Howard Grubb. Besides the plates to form the great chart, a second set of plates for a catalogue is to be taken, with a shorter exposure, which will give stars to the eleventh magnitude only. These plates, the permanent committee have recently decided, are to be pushed on as rapidly as possible, though as far as may be practicable, plates for the chart are to be taken concurrently. Already Dr. Gill, with the assistance of Professor Kapteyn, has nearly brought to a conclusion a preliminary photographic survey of the southern heavens.

***

THE PHOTOGRAPH IN EXPLORATION.—Photography seems likely to play an important part in exploration as well as in astronomy. Colonel Tanner, of the Indian survey, who for ten years has tried to map Nepaul, a forbidden ground, is of opinion that photography would be most useful in surveying the Himalayas, especially such parts as Europeans are not allowed to visit, and in surveying the peaks above the snow-line. For such work it is suggested captive balloons might be employed. The French have long used them for taking bird's-eye views. In this connection it may be noted that a rapid method of photographic surveying has already done good service in the Rocky Mountains. A special camera carefully levelled was employed, and the views were taken on measured spaces of ortho-chromatic gelatine plates.

STIMULATION OF MUSCLES UNDER THE INFLUENCE OF LIGHT.—In the course of some interesting experiments recently undertaken by M. D'Arsonval, when a freshly prepared frog's muscle was suddenly illuminated by the light of an arc lamp deprived of its heat rays by traversing a cell filled with a solution of alum, the muscle showed a slight tremor. When M. D'Arsonval further mounted the muscle on a skin diaphragm stretched over a funnel, the tremors accompanying each impingement of the light emitted a sound which could be heard in the funnel.

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A NEW PYROMETER.—A very interesting Pyrometer for measuring high temperatures was brought before the British Association at Cardiff by that distinguished chemist and metallurgist, Professor W. Roberts-Austen, C.B. It is based on the principle that the current of electricity produced by heating the junction of two different metals in contact increases in strength in proportion to the temperature of the junction. Since the current sent through a galvanometer becomes a measure of the temperature of the junction, if such a junction is placed in a furnace, and connected by wires with a galvanometer at a distance, the temperature of the furnace can be read off the scale. In the new instrument, it is recorded on a band of photographic paper by a beam of light reflected from the needle of the galvanometer. By employing platinum for one metal and an alloy of platinum with ten per cent. of sodium for the other, Professor Austen has succeeded in measuring temperatures up to the melting point of platinum.

***

A WEATHER EXPERIMENT.—At Tarbes, in the Hautes Pyrenees, a district which suffers from destructive hail storms, which often result in the ruin of the vintage, high poles having metal caps and connected by wires have been lately erected by the Director of the Observatory of the Pic du Midi. His project is to steal away the electricity of the clouds and thus prevent the formation of hail.

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THE USES OF PEAT.—The uses of peat promise to be as many and various as those of the cocoa-nut in the islands of the Pacific. From fibrous red peat a fine quality of peat wool is spun, which, either pure or mixed with wool of an animal source, is capable of being made into rugs, horse-cloths, carpets, and other heavy goods. French veterinary surgeons largely advocate these hygienic horse-rugs, and they are already adopted by the leading French railways and omnibus and cab companies. In the cheap sanitary workmen's dwellings about to be erected under the auspices of the municipality of Paris, peat wall padding is to be used, and the commissariat department of the French army has adopted a powder prepared from peat, which has all the properties necessary for the preservation of perishable provisions. The fibrous 'waste' which arises from the manufacture of peat wool is used for the absorption of sewage matter and the sanitation of houses, hospitals, cesspools, etc., and also as coverings for steam boilers, peat being an excellent insulator and non-conductor of heat. A carbon free from sulphur and of excellent service in the manufacture of charcoal, iron, and steel can also be obtained from peat waste. Chemical peat manure is said to be equal to guano, and a very superior manufactured peat fuel has been lately put upon the market. It is formed of black peat mixed with inflammable oils and pressed into solid blocks or briquettes. Nor is this all; an apparatus has been lately patented for bleaching peat and peat fibre, with a view of supplanting wood pulp in the manufacture of paper. If these peat products meet with favour in England, they should create an important Irish industry.

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THE TRANSIT OF STARS.—The ingenious photographic device of a young Jesuit priest which enables a star to record its time of transit across the meridian is now in use in the College Observatory, Georgetown, U.S. A small camera is fixed at the eye piece of the telescope in such a manner that the image of the star is received on the sensitive plate at regular intervals by the operation of a shutter which is opened and closed by an electric current from a sidereal clock. The spider lines are also photographed on the same plate by means of a lamp light sent into the object glass without interfering with the trail of the star on the plate. The inventor claims that this method is accurate to within one-thousandth of a second.

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THE SPONTANEOUS IGNITION OF COAL.—It is generally supposed that the spontaneous ignition of coal results from the heat developed by the oxidation of pyrite. Professor Lewes is of a different opinion. He points out that the coal most liable to ignition contains as little as 0·8 per cent. of pyrites, and rarely more than two per cent., a quantity which, though concentrated in one spot and oxydized with the greatest rapidity, could not cause a rise of temperature sufficient

to cause the coal to ignite. Moreover, heaps of pure pyrites do not show any tendency to serious heating. Professor Lewes thinks that the true explanation is to be found in the power of freshly won coal to absorb from one-and-a-half to three times its volume of oxygen from the air. This oxygen attacks and decomposes some of the bituminous hydro-carbons in the coal. Up to 30° centigrade the absorption goes on slowly, and the chemical action is so slight that there is little risk of undue heating. As soon as this temperature is exceeded, in some classes of coal ignition becomes only a question of time and mass. The action of mass, condition, and temperature are clearly traceable, Professor Lewes thinks, in the statistics of spontaneous ignition in coal cargoes, and he accounts for the increasingly frequent bunker fires on fast-liners by the rise of temperature occasioned by the bunker bulkheads being too close to the hot air upcast shafts from the boilers and furnaces.

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THE BREATHING OF INSECTS.—According to a distinguished French scientist, M. Contejean, the process of breathing in insects is the reverse of that of vertebrate animals. While inspiration in vertebrates is an active process and expiration a passive one, with insects inspiration is passive and expiration active. The air is exhaled by a contractile effort of the body. Hence, when an insect is wounded, the escape of blood takes place at each expiration. The respiratory movement, M. Contejean found, is not interrupted by cutting off the insect's head or by the absorption of curare poison.

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NEW DICTATION TESTS.

STANDARDS IV. AND V.

No. 1.

At that time all the trade between Europe and the rich Indies had to be carried on overland, as the passage round the south of Africa —the only sea route to the East—had but just been discovered. It was thought that by sailing continually onwards to the west, over the boundless Atlantic, never before crossed by European ships, a way might be found to China and the far East by water. Of course nothing was then known of the vast American continent—that mighty barrier which so completely prevented the direct passage westward to the Indies by sea.

No. 2.

The buffalo is of great use to the Indians. Its skin forms their chief garment, its flesh is often their only food, and from its bones they make innumerable articles, ranging from bows and arrows to drinking cups.

The winters in this settlement are dry and healthy, but very cold. The ground is covered with snow, the lakes are generally frozen over, and all travelling is done by sledges.

And very rough-hewn vehicles these sleighs often are, but when well wrapped up in thick buffalo skins the occupants are comfortable enough. They often traverse hundreds of miles in them.

No. 3.

There a negro guide saw me, clothed in an oil-skin suit, and led me over the broken ledges which stretch a long way in behind the Falls. The scene here was terrific. The sun shining on the extended sheet of falling water, made a large circular rainbow, which would have been much more charming were it not for the blinding spray which blew on our faces. But there we stood in trembling posture, terrified with the resounding echoes which continually answered and re-answered from the caverns behind, enough to awe the strongest heart.

No. 4.

It is situated in the midst of a wide and fertile region, little of which, however, is at present under cultivation. In the neighbourhood are extensive forests, from which immense quantities of *timber* are obtained, and the whole district is renowned for its lumbering trade.

Since its selection as the capital, *Ottawa* has increased rapidly in size and importance, its newly-erected public buildings being handsome and imposing. Its site has thus been described: 'It stands nobly on a magnificent river, with high overhanging rocks, and a natural grandeur of position which has perhaps gone far to recommend it to those whose voice in the matter has been potential.'

No. 5.

Comparing latitude with latitude, we find that southern seas are, as a rule, cooler than northern. The reason is obvious: the cold latitudes of the south are all water; of the north they are mostly land. The Antarctic regions are entirely open to southern oceans and their flow of equatorial waters; northern seas, on the other hand, are shut out from the flow of intertropical waters, except by those comparatively small channels which reach to and from the Arctic Ocean; so that, as the warmer waters flow north or south from the Equator, those that go south cool faster, by reason of the larger cooling surface in the extra-tropical regions of that hemisphere.

No. 6.

There is not a sign of leafage on the hawthorns. The great mountain ash that towers above its fellows of the dingle is no forwarder than yonder pair of tall, slim ash trees, or the dark oak beyond them, wearing even yet the brown leaves of the autumn. The lingering frosts, the keen and searching winds have so held back the flowers that it is hard to realise that we are so far on in the season. There is merely a handful of primroses where the thickets should be full of them; there is the very thinnest scattering of anemones where the dingle should be strewn with their white and star-like blooms.

No. 7.

It is reckoned that two pairs of rabbits may in three years increase to five millions, which is certainly a large family to rear at other people's expense. Ferrets and weasels have been let loose among them, but these creatures will only kill while their appetites are unsatiated, and it is found that a diet of perpetual rabbits soon begins to pall. Phosphorised grain and poisonous fumes blown into their burrows are found most effectual. Some slight diminution of the pest is reported, but generally speaking the Victorian rabbit remains master of the situation.

No. 8.

After sundown scores of grey figures will steal silently out of these hollows, frolic along the by-ways of the dingle, and spread their skirmishers far out across the pasture. In a hollow of the bank, under the gnarled and rotting roots of an old hazel, is strewn a heap of nutshells, each with a round hole neatly gnawed, mostly in the side. Here, then, the mice have brought the plunder of the hedgerow to feast on at their leisure, and on this little terrace, where, perhaps by the light feet of long generations, the tiny woodlanders have held their revels.

No. 9.

Among the branches of that very tree two ringdoves silently alight, the soft grey of their beautiful plumage showing out boldly on the dark hues of the ivy. Quiet as their movements are, the least sound that startles them will send them crashing out of the tree with a perfect clatter of their great strong wings.

But birds are not the only tenants of the dingle All along the steep banks and among the hedges is the brown earth turned up by innumerable rabbits, whose dark caverns seem as lifeless as the holds of the lost cliff dwellers of Colorado.

No. 10.

The keen air of April that among the leafless branches sounds like the sea has been hardly felt down in this narrow dingle, where the warm sunshine seems the very soul of summer. It is a quiet spot. A mere nothing in the landscape—little more than a broad hedgerow, not 20 yards wide anywhere, and at its best but a wandering line of coppice, just breaking with its trees and thickets the smooth expanse of the wide pasture land. But these high banks overrun with hazel-bush and bramble are quiet enough to shut out the cold weather and to soften all the noises of the outer world.

No. 11.

There is nothing for it then but to gallop down the slope to where, across the entrance of the dingle, the towing-path of a canal winds along the foot of the hills. It is not so long since a worn-out hunter, fallen from his high estate, was toiling at a barge along that monotonous level when the hunt, with its loved and well-known music, came thundering past him. With a mighty effort the old horse snapped his bonds, and with forty feet of broken tow-rope trailing after him followed the chase far out across the country.

No. 12.

We push through the noisy crowd at the stile with the best of them, cross the field, scramble up the wide shale path, and cluster on the pit bank. Dobbs, the engine man, shows his shining face

for a moment at the window of his den, and then grasps the lever. We step on the cage. The signal to lower is given. Then down we go, with a great clank at the start, but afterwards with a swift, easy glide, the lichened brickwork and russet iron tubbing that form the shaft appearing to race away from us as we descend, to leap wildly upward in pursuit of the return cage. By quaint rust-figures, and trickling water, and accompanied by strange lights and shadows, we flit to the pit bottom.

No. 13.

The thirty extra tons of spare sails, spars, and provisions, the fifteen tons of water, and the eighty-four tons of coal, made a great difference in our buoyancy, and the sea came popping in and out at the most unexpected places; much to the delight of the children, who, with bare feet and legs, and armed with mops and sponges, waged mimic war against the intruder and each other, singing and dancing to their hearts' content. This amusement was occasionally interrupted by a heavier roll than usual, sending them all into the lee scuppers, and sousing them from head to foot.

No. 14.

What infinite wonderfulness there is in vegetation, considered, as indeed it is, as the means by which the earth becomes the companion of man—his friend and his teacher! In the conditions which we have traced in its rocks there could only be seen preparations for his existence—the characters which enable him to live on it safely, and to work with it easily. In all these it has been inanimate and passive; but vegetation is to it as an imperfect soul, given to meet the soul of man.

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ESSAY WRITING FOR STANDARDS VI. & VII.

BY ARTHUR T. FLUX, B.A. (INTER.),

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TEACHERS need not be told that this is a subject of great difficulty to the majority of children, and one that demands a large amount of time both in the teaching and correction. The weak composition, the confusion of ideas, and the paucity of facts found in the majority of children's essays, are not attributable to the dulness of the class, but rather to the inherent difficulties of the subject itself.

To make satisfactory progress with it, we must first find out what are the difficulties which present themselves to children, and, secondly, how they may be best overcome.

One of the greatest obstacles a teacher has to overcome is the inability of children to write down a sufficient number of facts about a subject of ordinary interest. This arises from two causes—(1) A limited vocabulary, and (2) a hazy and superficial knowledge.

And first for the vocabulary. The number of words used by the child of the ordinary artisan or labourer is very few—not more than a few hundreds. The spoken language is essentially Anglo-Saxon, and such verbs as 'get' are used with various prepositions and adverbs as equivalents for other longer and more expressive verbs of foreign origin.

Thus we have 'get in,' 'get up,' 'get down,' 'get on,' 'get through,' &c., continually used for 'obtain admission,' 'arise,' or 'ascend'; 'alight' or 'descend'; 'succeed' or 'prosper'; 'perform,' &c. In conversation this is not so noticeable, but in a written exercise the continual repetition and poorness of diction become very apparent. The tendency in speaking is to use the shortest words possible, and this frequently degenerates into a loose style of expression, the use of colloquialisms, and slang, which grates painfully on the ear of an educated person.

Now, how may this be remedied?

We have some influences continually at work in school, of which the various reading books are perhaps the chief. But children may easily be taught to read words which they do not understand, and which they could not use correctly. In the first place then, see that the words occurring in a reading lesson are thoroughly understood. Do not be content with verbal explanations or synonyms, but make the children give the meaning of any doubtful word by using it correctly in a sentence. The *Repetition*, if a suitable piece is chosen, is especially valuable as a means of improving composition. New words are taught, and the ideas of good writers are presented clothed in the very best English.

The *Teacher's language*, again, should be very helpful. Young teachers frequently do not give sufficient attention to the style of their remarks to a class. Loose, inaccurate expressions are used, which the children almost invariably copy, and reproduce. Another powerful lever is the *School Library*. Every school should be provided with at least a few dozen books of interest to older scholars. Of these, happily, there is no lack. By means of them a love of reading is inculcated; new words, phrases, and allusions are learnt, and composition becomes an easy matter, for there is a copious supply of words at hand.

This acquisition of words must of necessity be a gradual process, and, therefore, the means mentioned above must be put into operation with the younger classes.

Limited Knowledge. This is generally the result of a lack of observation, a deficient memory, and an absence of any general reading on the part of the child.

To remedy these, appears at first a nearly impossible task to the teacher, who has only a very few hours at his disposal daily in which to train the children under his charge. Nothing but education in its strictest sense will cause the difficulties to entirely disappear, but they may be lessened very considerably in a year's work by proper teaching and a good method.

It is a very good plan to select the subjects for the essays a week or two in advance of the time when they will be set, and to announce them to the class, or post the list in a conspicuous position in the room. This gives all the children a chance to prepare the subject matter of the essay which they know they will be called upon to write. The reading books, library, and books at home will generally supply a sufficiency of facts, and each child should be expected to make some amount of preparation for the various exercises.

The class should also be encouraged to ask the Teacher's advice on any points of difficulty, or for any information which they may be unable to procure. This should always be given willingly, and every stimulant put forward to encourage the class to search for information on any point.

Choice of Subjects. In selecting the subjects for essays, care must be taken to choose only those that appeal to the children's interest, and such as are fairly within their comprehension. They cannot be expected to write intelligently on matters which are far above their understanding. In fact, it is better to err in the opposite direction, and set them too easy. A list of suitable essays will be given.

Arrangement of Essay. We now suppose the child has at command a sufficient number of facts, and an ample supply of words with which to express them; the next important point is, 'How should the essay be arranged'? In what order or plan should the facts be stated? This

must be shown by careful teaching and numerous illustrations by the master.

All essays and letters should be written on some definite plan, of which an outline or skeleton should be prepared beforehand, and written on blackboard. If this is not done the writers will wander from one point to another, repeating the ideas most prominent in their imagination, and neglecting those which do not appeal so forcibly to them. The essay will be vague, wandering, and ideas will be associated in adjoining sentences, which may be very incongruous. An example will, perhaps, make the foregoing clearer.

Suppose the subject is An Essay on the Signs of Spring.

Probably there will be no dearth of facts for this, but it is more than probable that the various essays will be but poorly arranged. The Teacher, with the co-operation of the class, should prepare such an analysis on the blackboard as the following:—

SIGNS OF SPRING.

1. Spring marked by many signs. All seasons may be told by appearance of the earth and occupation of its inhabitants.

2. Chief signs.
   (1.) Buds, leaves, flowers (*garden*), crocus, snowdrop (*wild*), violet, buttercup, primrose, grass.
   (2.) Birds, song and nest building. Return of migratory swallow, martin, cuckoo.
   (3.) Re-appearance of insect life — dormant through winter.
   (4.) Weather: Days longer, brighter, warmer. Rain instead of snow—helpful to growing plants.
   (5.) Work in country—Preparing fields, sowing seed, &c.
   (6.) Change in boys' games, &c.

3. Effect of signs on mankind.

Summer, *Autumn*, and *Winter* would be treated in the same way.

This outline should be prepared a day or two before the essay has to be written, and copied down in note books kept for the purpose. This impresses the facts on those who are doubtful of them, and is besides useful for reference and revision.

Typical essays only need be treated in this manner. School hours are too brief to pursue the same course with every lesson, but it must be remembered a few essays done thoroughly and well are of more service than many done carelessly and inaccurately.

If children are taught to consider the *plan* as a necessity to the essay, they soon acquire the habit of arranging their ideas in some kind of order.

Numbered heads, of course, would not appear in the essay, but each time a new subject or section is started, a fresh line should be commenced, and inset about an inch.

Time Allowed.—Sufficient time should be allowed to write the essay—30 to 40 minutes—and no reference must be allowed to note books or blackboard. It is preferable to keep a set of exercise books exclusively for essays than to have them done on separate sheets of paper. The essay should be dated.

Correction.—Much of the success in essay writing depends upon the way in which they are marked, and this is a matter of great importance. To mark 40 essays properly takes at least an hour, and any Teacher would find great difficulty in finding this time to spare in school. The majority of Teachers, perhaps, sacrifice their spare time for the good of their class, and mark the essays out of school hours, and this is by far the best plan, though not the most attractive.

In correcting, it is not enough to mark out what is wrong; what would be right must be inserted, and a strenuous effort made to prevent such mistakes in future. General mistakes may be pointed out collectively, and treated on the blackboard, and individual errors explained during the next lesson in which the Teacher has time to spare.

Mistakes should be marked in red ink, and some system of marks should be used which the children readily understand, as this saves time in marking. The following may be found useful:—

(1.) Word omitted:—Signs ∧ spring.
(2.) Mistake in grammar:—Wavy line under.
(3.) Mistake in spelling:—Straight line under.
(4.) Error in fact:—Enclose in brackets.
(5.) Mis-placed words and phrases:—Line round, and arrow to the right place.

Numerical marks should be assigned to each essay, say 20—and one or two deducted for each mistake. The best essay should be read to the class, inserted in School Magazine, or copied and pinned up in the room, as a reward, and a healthy emulation encouraged amongst the members of the class. A prize should also be awarded to the one who makes most progress. The marks should be totalled and arranged in order of merit each quarter, and the list posted up.

Finally, every means must be adopted to secure the co-operation and interest of the class, or otherwise but little progress will be made.

In our next issue there will be specimen analyses and a list of suitable subjects for essays.

(To be continued.)

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PUBLICATIONS REVIEWED.

The Royal Atlas Reader Text Books. London: T. Nelson and Sons.

These are six books to be used as home-lesson or revisal books along with the Royal Atlas Readers. They contain the pith of the lessons in the Readers, are well supplied with maps divided into squares, and with numerous questions which can be asked by the teacher and answered orally or on paper by the scholar. The information is generally correct, and given in a manner easy to be remembered. While suited more especially to the Readers which they are meant to accompany, they can be used as home-lesson books in any school.

Excelsior Test Atlas. London: G. W. Bacon and Co., Limited.

Contains sixteen entirely new maps in black and white, showing all physical features and principal towns, but containing no names. Will prove of great service to students and scholars during their time for revision of the period's work. The maps are printed on stiff paper with limp cover, having cloth band up the back, and cost only a shilling.

Wall Map of Australia. London and Edinburgh: W. and A. K. Johnston.

We can give cordial commendation to this map. It has all the characteristics which may be summed up in the word 'practical.' It is well printed, satisfactorily tinted, serviceably got up, and not overcrowded with names. The only point to which exception might possibly be taken is in connection with the insets introduced at the foot of the map, which come so close in places to the Australian coast line as somewhat to impair the formation of a clear notion of the shape of the giant island. It would have been better if the map had been made a couple of inches larger, and more space allowed to intervene between the insets and the body of the map.

The handbooks which accompany Messrs. Johnston's wall sheets deserve special mention. They are carefully compiled, well printed, and replete with information. Indeed, it would be difficult to devise any better school-book on Geography than would be formed by the combination of the complete series of handbooks.

Illustrations of Physical Geology: Structural Geology and Petrology (Sheet No. II.); by Alexander Johnstone. London and Edinburgh: W. and A. K. Johnston.

This sheet contains upwards of twenty diagrams explanatory of Structural Geology and Petrology. In connection with the first named, the curvature and inclination of strata, faults, outlier and inlier, unconformity, and overlap are clearly illustrated; whilst in matters pertaining to Petrology, drawings are given explanatory of the deposition of sandstone, the cleavage of slate, &c., and the evolution of igneous rock. The sheet is nicely and clearly printed in colours, serviceably mounted, and seems well adapted for the purpose intended.

The Royal English History Readers: The Tudor Period, for Standard V.; The Stuart Period, for Standard VI. London: T. Nelson and Sons.

These two volumes belong to a new series produced to meet the requirements of the latest Code in the subject of English history. Each claims to be 'a Reader and Text-Book in one,' and the claim is likely to be allowed by those who put it to the test. In the lessons which record the general course of events those matters which affect the life of the people have due attention. A distinguishing feature of each book is a series of lessons on a special subject bearing on some striking characteristic of the period. The history of the Tudors is supplemented by a course of seventeen well-written lessons on the 'Great explorers,' beginning with the Cabots, and ending with Sir Walter Raleigh. The history of the Stuarts is followed by a course of fifteen lessons under the general heading, 'How we are governed.' These recount the 'History of Parliament,' tell 'How laws are made,' and 'How members of Parliament are elected.' A few poetical pieces are interspersed. Capital notes and summaries of each lesson form a sort of appendix to each volume, and these are followed by a full table of dates, and a collection of outline biographies of eminent persons of the period. Good type, abundant illustrations, neat sketch maps, and strong binding in an ornamental cover, add to the attractiveness of the series, which we cordially commend to teachers seeking historical readers.

The Century Geographical Readers. No. 4. London: Blackie and Son.

A thoroughly satisfactory reading book on the British Isles, Australia, and Canada is here offered to us. It is written in a pleasant descriptive style, and apparently by those who have seen many of the places mentioned. The illustrations are all good, and the maps and the geographical summary are a great help. We cordially recommend the volume.

The Royal School Series: A Brief History of the British Empire. London: T. Nelson and Sons.

There is little scope for novelty in a school history of our country. The one before us has the merit of being readable, and is otherwise well suited to the minds of young learners. The narrative is marked by simple directness of statement, and the facts are chosen with excellent judgment. The paragraphs are almost all brief, and each has a heading in heavy type to indicate its subject. A few lessons dealing specially with social life are included, and the book is illustrated with many portraits and other wood-cuts, some sketch maps, and genealogical tables. A tolerably full table of dates and a geographical appendix are placed at the end. The volume is clearly printed on good paper and stoutly bound.

The Holborn Geographical Readers. No. 6. London: Educational Supply Association, Limited.

This is a new edition of a book already noticed in the *Practical Teacher* to meet the requirements of the latest code. The name of Mr. Lawson, the editor, is sufficient guarantee of the accuracy and fulness of the information the book contains, while the method of presenting the facts is interesting and calculated to engender a love of reading in the pupil's mind. The book is a good one in every respect.

Simple Stories from English History. Parts I. and II. London: Blackie and Son.

Books suitable for Standards I. and II.: not meant to teach history, but to tell stories. The stories are selected from every part of English History, are told in simple but not foolish language, and are sure to be liked by the children. The second book is slightly in advance of the first in style and difficulty and has a synopsis of the stories at the end, with more definite historic information not contained in the book itself. The lists of words are at the end of the books, which are a suitable introduction to the others of the Century Historical Readers already noticed.

'Unrivalled' Six-inch Globe. London and Edinburgh: W. and A. K. Johnston.

This is an attempt to supply a demand which we are informed has arisen of late for a cheaper style of Geographical Terrestrial Globe. We have closely examined the specimen before us of this article, and feel obliged to conclude that, although the price is low—being only five shillings—mere cheapness may sometimes be adversely criticised. It is possible to do the best one can for a certain sum of money, and yet to achieve a result not altogether satisfactory. In cases of this description we should recommend better results and correspondent increase of price.

The Century Historical Readers No. 5. The Tudor Period. By Thomas Archer. London: Blackie & Son.

This reader follows the lines laid down by the new Code for a course of English history for the standards. The author is a practised writer of ability, and has set before him a definite task of tracing the growth of our constitution under the Tudor rule. This task he has accomplished successfully. At the same time the book is made attractive and stimulating to the mind of the young reader by the pleasant way in which it records the deeds of eminent English men of that stirring time—Raleigh, Drake, and other explorers, Wolsey, More, Shakespeare. The decay of Feudalism and the rise of a powerful middle class are carefully traced, and the last few lessons deal with the English Parliament, its growth and functions. Teachers will find this reader well adapted for use in Standard V.

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The Volume for Standards V., VI., and VII., Price 1s. 6d., will be ready in October.

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LATIN and **MATHEMATICS,** Stage II., for Male Students, 12th SEPTEMBER.

SCIENCE AND ART CLASSES.

In this Section the Students of the College scored nearly **500 Successes** at last May Examination.
SCIENCE Classes in all subjects for next May Examination begin on various dates from 1st to 30th SEPTEMBER. See Prospectus for particulars.
ART Classes for next May Examination begin 21st of SEPTEMBER. There will be a Special Class for **CLAY MODELLING.**
All Science, Art, and Language Classes are free to Certificate Students. All such Students intending to enter here in January next for Certificate, should now begin their Science, Drawing, and Languages.
CORRESPONDENCE Classes in all **SCIENCE** subjects, and all the Art subjects necessary for 'D' Certificate, begin SEPTEMBER 24th.

MATRICULATION.

(LONDON UNIVERSITY.)

Class for June, 1892, Exam. begins SEPTEMBER 12th, and will be conducted by MR. S. BLOWS, M.A. Honours Camb., B.A. Honours London; MR. E. T. MARSH, M.A.; MR. A. COGERY, B.A., L.L.. University of Paris, Officer d'Académie, Examiner in French to the Intermediate Education Board, Ireland; MR. J. W. SAMUEL, B.A., London Matriculation Honours; and PROFESSOR CUSACK.

MATRICULATION.—(Continued.)

RESULTS OF JUNE, 1891 EXAMINATION.

9 Sat for Examination. 7 Passed. ALL FIRST CLASS.

One Gentleman failed in a subject which he had not studied here.
One Lady who had studied all the subjects here failed in Light and Heat, but was not marked weak in any other subject.

LL.A. EXAMINATION.

(ST. ANDREW'S UNIVERSITY.)

Classes for June, 1892, Exam. commence SEPTEMBER 16th in—
ENGLISH HONOURS, HISTORY, EDUCATION, FRENCH,
and any other subject of the curriculum for which a sufficient number of names will be entered.

RESULTS OF 1890 EXAMINATION.

100 per cent. passed. 100 per cent. took the Honours Paper in one or more subjects.

RESULTS OF 1891 EXAMINATION.

Of all students who began the course in 1890, worked completely through it, and sat at Examination,

100 per cent. passed. 100 per cent. took the Honours Paper in one or more subjects.

Such results as these are unsurpassed in preparing for University Examinations.

KINDERGARTEN, 1891-2.

Class begins SEPTEMBER 16th, and will be held on Wednesdays and Saturdays up to July, 1892. At conclusion of course an Examination will be held, and Certificates granted to the proficient. FRAULEIN HEERWART is the Examiner.

The School Board for London agree to recognize these Certificates.

FRENCH CLASS begins September 1st.

A Special Class for the reading of the French Author prescribed for Certificate Exam. (1st Year Females) now meets on FRIDAY EVENINGS, 6.30 to 8.

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STANDARD V.

Card 1.

1. I spent $\frac{5}{6}$ of my money, and then had £4 3s. 4d. left. What had I at first?
2. 17 tons were carried 44 miles for £5 10s. How far would they be carried for £6 15s.?
3. Find the cost of 987 articles at £1 19s. 7½d. each.
4. A ton of sugar was bought for £16, and then sold at 2¼d. per lb. What was gained or lost on the whole?

Card 2.

1. Suppose a house requires 2 rds. 25 pls. 8 sq. yards, how much will 504 houses require?
2. $\frac{6}{9} + \frac{5}{8} + \frac{1}{6} - \frac{3}{4}$.
3. A farm of 50 acres 1 rd. produces 137 qrs. 2 bush. of corn. How much would a farm of 67 roods produce?
4. Find the value of 16 barrels 9 galls. 3 qts. at £1 19s. per barrel of 36 gallons.

Card 3.

1. Find the value of 30 sq. yds. 2 sq. ft. 100 sq. inches of painting at ¾d. per sq. inch.
2. If a fortune is divided among three brothers as follows—$\frac{1}{6}$ to the eldest brother and $\frac{1}{4}$ to the next, how much will the youngest brother receive, supposing £12,000 was the amount divided?
3. Find the cost of 4,000 books at 3s. 4½d. each for printing and 2s. each for binding.
4. 19 horses can draw 25 tons 15 cwt. 2 qrs. of coal. How much will 95 horses draw?

Card 4.

1. Find the value of 15 tons 14 cwt. at £2 16s. 3d. per ton.
2. To the difference between $\frac{6}{7}$ and $\frac{3}{4}$ add $\frac{1}{9}$.
3. What is the cost of 758 articles at 19s. 10½d. each?
4. How far can 100 tons be sent for £5 6s. 8d. at the rate of 3s. 4d. for 19 miles?

Card 5.

1. A house and garden are worth £150 12s. 6d. and the house is worth 3 times as much as the garden. What is the value of the house?
2. Find the cost of 509 acres of land at £5 0s. 6d. per acre.
3. If a bill of £30 3s. 8d. is reduced by 3s. 4½d., what ought a bill of £90 11s. to be reduced by?
4. Find the sum of $\frac{3}{5}$, $\frac{7}{9}$, $\frac{11}{10}$, and 1.

Card 6.

1. Find the cost of 27 houses at £97 15s. 9d. each.
2. If I spend £20 5s. 6d. in 20 days, how long shall I be spending £152 1s 3d.?
3. The income from a factory was £8,000 annually. Wages were £70 10s. 9d. per week, rent £507 per year, and gas £21 per quarter. What was the profit of the owner (52 wks. = 1 yr.)?
4. Take $\frac{7}{9}$ from $\frac{9}{7} + \frac{4}{3}$.

Card 7.

1. Simplify $\frac{9}{7} + \frac{5}{8} + \frac{3}{4}$.
2. Find the cost of 609 horses at £51 3s. 2½d. each.
3. Make out the following bill:—6½ lbs. of beef at 5½d. per lb., 7¾ lbs. mutton at 11d. per lb., 16 stone of veal at 10½d. per lb., 14½ lbs. of suet at 4½d. per lb., 3½ lbs. of beef at 7s. 6d. per stone.
4. If a bicyclist goes 160 miles in 10 hours, how long would it take him to go from one town to another 200 miles apart?

Card 8.

1. Take $\frac{1}{7}$ from $\frac{3}{4} + \frac{5}{6}$.
2. What will 15 acs. 3 rds. 20 pls. cost at £5 15s. 6d. per acre?
3. A man owes £1,000, but can only pay 18s. 4½d. in the £. What does he still owe?
4. Supposing a boy can walk $\frac{3}{4}$ of a mile in 50 minutes, how long will he take to walk 7½ miles?

Card 9.

1. What would be the weight of the pennies in £150 if 5 pennies weigh 3 ounces?
2. Find the value of 607 chairs at 19s. 8½d. each.
3. Supposing an army of 5,000 men march 20 miles in 3¾ hrs., how long would it take one man to march 150 miles?
4. Take $\frac{6}{7} - \frac{5}{1\frac{2}{3}}$ from 1.

Card 10.

1. Make out this bill:—850 bricks at £1 10s. per 1,000, 69 ft. of timber at 7¾d. per foot, 16 window sashes at 6s. 8d. each, 17 planks at £1 5s. 4d. each, 1½ dozen locks at 3s. 5½d. each.
2. A field contains 24 acres 25 pls.; what will it cost to sow it if a pole requires a peck of wheat at 30s. per quarter?
3. From 1 take $\frac{3}{4} + 1\frac{1}{2}$.
4. Find the value of 3 qrs. 7 bushels 3 pks. at 5s. 9d. per bushel.

Card 11.

1. A horse is worth £17, and is four times the value of a sheep. How many sheep can I purchase for £72 5s.?
2. What will the tax on £1,050 amount to at 5s. 6¾d. in the £?
3. Simplify $\frac{3}{8} + \frac{5}{9} + \frac{1}{4} + \frac{2}{3}$.
4. If 200 horses can eat 50 qrs. of wheat in 7 weeks, how long will 120 horses be in eating the same quantity?

Card 12.

1. By how much is $(\frac{1}{4} + \frac{3}{9})$ greater than $(1 - \frac{4}{5})$?
2. How much will 1,070 baskets cost at £1 0s. 7½d. each?
3. If 90 horses can pull 250 tons, how much will 27 horses pull?
4. Find the value of 175 tons 15 cwt. at £3 10s. 6d. per ton.

Card 13.

1. At a concert £25 was taken. 100 paid 1s. each, 75 paid 6d. each, and 200 paid 3d. each. Supposing the rest paid half-a-crown each, how many people were there altogether?
2. Make out the following bill:—½ gross buttons at 6½d. per doz., 45 reels of cotton at 5 for 3d., 15 yds. of silk at 7½d. per yd., 16 yds. worsted at 3s. 6d. for 4 yds., 18 yds. of fine silk at 9¾d. per yd.
3. Find the sum of 1, $\frac{5}{9}$, $1\frac{7}{12}$, and $\frac{1}{6}$.
4. Find the cost of 654 articles at £1 19s. 3½d. each.

Card 14.

1. If 19 jackets are made out of 750 inches of cloth, how many can be made out of 1,500 ft.?
2. Find the cost of 19 tons 14 cwt. 3 qrs. at £20 per ton.
3. A man exchanged 1 cwt. of tea for 1,680 lbs. of sugar at 3d. per lb. What was the price of the tea per lb.?
4. Simplify $(\frac{3}{7} + \frac{5}{8}) - (\frac{5}{9} - \frac{3}{7})$.

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Card 15.

1. If I can travel 156 miles for 9s. 9d., how far can I go for 9s. 4½d.?
2. Find the cost of mending a road 13 mls. 6 fur. 34 pls. long at £3 6s. 8d. per mile.
3. A owned $\frac{7}{8}$ of a parish, and then sold B $\frac{1}{4}$. How much would A now want to make $\frac{7}{8}$?
4. Find the cost of 2,503 baskets at 15s. 10½d. each.

Card 16.

1. Make out the bill:—500 reels at 1s. 6d. per reel, 5½ lbs. nails at 4½d. per lb., 10 lbs. butter at 1s. 1½d. per lb., 2 gross eggs at 24 for 1s.
2. A train goes 25 miles 1 fur. in 2 hrs. 10 min.; how far will it go in 3 hrs. 15 min.?
3. What is the value of 493 articles at £3 8s. 5d. each?
4. A tailor gave a coat worth 31s. 6d. and 3 vests each worth 7s. 6d. for some bacon worth 8d. per lb. How many lbs. did he get?

Card 17.

1. Find the cost of repairing a path 3 miles 7 fur. 65 yds. long at £58 13s. 4d. per mile.
2. Find the sum and difference of $\frac{7}{12}$ and $\frac{6}{7}$, and add them together.
3. What is the cost of 1,954 tons of hay at £1 18s. 11d. per ton?
4. If John owns $\frac{1}{8}$ of an estate and his brother the remainder, what will his brother's share be if he sells half of it?

Card 18.

1. Find the value of 187 sheep at £2 9s. 11d. each.
2. If 3 acs. 3 rds. cost £11 10s., what would 25 pls. cost?
3. How much is left out of a cheese after selling $\frac{1}{3}$ on Monday, $\frac{1}{2}$ on Tuesday, and $\frac{1}{7}$ on Wednesday?
4. If a clock gains 3 min. 20 secs. in 3 hrs, how much will it gain in a week?

Card 19.

1. Make out and receipt this bill:—248 knives at £1 10s. per dozen, 19 forks at 6½d. each, 1 gross spoons at 3½d. for 4, 8 lbs. of steel at 3s. 4½d. per lb., 10½ yds. steel wire at 7s. 6d. per half-yard.
2. Add $\frac{6}{7}$, $\frac{5}{12}$, $\frac{1}{9}$, and $\frac{2}{3}$.
3. Find the cost of 7 cwt. 2 qrs. 5 lbs. at £3 0s. 8d. per cwt.
4. If 25 men can build a wall in 39 days, how many men could build it in 75 days?

Card 20.

1. A bankrupt owes £6,317 15s., and pays 7s. 7d. in the pound; what do his creditors lose?
2. What will be the cost of 4 tons 11 cwt. 2 qrs. 18 lbs. at £6 3s. 8d. per cwt.?
3. From the sum of $\frac{3}{8}$ and $\frac{1}{2}$ take the difference between $\frac{2}{3}$ and $\frac{5}{6}$.
4. A tree casts a shadow 16 ft. 6 in. long, while the shadow of a neighbouring tower is 49 ft. 6 in. If the height of the tower is 94 ft. 6 in., what is the height of the tree?

Card 21.

1. Make out a bill for the following:—13 tables at 14s. 10d. each, 54 chairs at £2 14s. per dozen, 30 sq. yards of linoleum at 2s. 3d. per sq. yard, 3 men's wages for 3 days at 4s. 3d. per day each.
2. After paying 7d. in the £ income tax, a gentleman had £971 16s. 1d. left. On what amount had the tax been charged?
3. Find the cost of 13 qrs. 2 bush. 1 pk. at £3 18s. 8d. per quarter.
4. Which is the greatest and the least of the fractions $\frac{7}{9}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{4}{5}$, and $\frac{3}{10}$?

Card 22.

1. Find the cost of seventeen thousand and fifteen articles at thirty-nine pounds sixteen shillings and eleven pence halfpenny each.
2. If 43 articles are bought for £27 19s., how many may be bought for £39?
3. After eating $\frac{4}{11}$ and then $\frac{5}{13}$ of a cake, what fraction of the cake has a boy left?
4. What is the value of 174 sq. yds. 139 sq. in. of land at £1 7s. per sq. yard?

Card 23.

1. Make out and receipt the following bill:—5 dozen copy books at 27s. per gross; 7 dozen exercise books at 21s. per gross; 8 dozen lead pencils at 8s. 6d. per gross; 13 doz. slates at 39s. per gross; 35 rulers at 7s. 6d. per doz.
2. What is the difference between the sum and difference of $\frac{5}{6}$ and $\frac{8}{9}$?
3. Find the rent for 9 mths. 1 wk. 3 dys. at 12s. 3d. per month of 4 weeks.
4. If I pay 39s. per cwt. for lead, how much will it cost to cover the roof of a building with lead that weighs 5,495 lbs.?

Card 24.

1. What is the value of 8,769 articles at 19s. 11¾d. each?
2. How many steps would a man take in 3 miles, stepping 2 ft. 9 in. on the average each time?
3. A wall 538 yards long and 3 yards high was built by 72 men in 20 days; how many men would have been required to complete it in 16 days?
4. What will be the cost of draining 6 mls. 5 fur. 165 yds. at £5 10s. per mile?

Card 25.

1. A bankrupt pays his creditors 2s. 7½d. in the £, and his total payments amount to £750 15s.; what are his debts?
2. Make a bill for:—8 lbs. of tea at 2½d. per oz.; 16 stone of salt at 4½d. per stone; 9 stone of sugar at 1s. 9d. per half stone; and 3 dozen oranges at 1½d. each.
3. What must be taken from the sum of $\frac{5}{8}$ and $\frac{3}{10}$ to leave $\frac{1}{12}$?
4. Divide £109 11s. 11d. among 13 men and 8 women, giving a woman twice as much as a man.

Card 26.

1. How much does a manufacturer pay weekly for wages, when 209 workmen receive 25s. 9d. per week, and 145 receive 34s. 3d. per week? (Work by practice.)
2. How many yards of matting 2½ ft. wide would cover the floor of a room whose length is 27 ft. and breadth 20 ft.?
3. What is the value of 19 cwt. 3 qrs. at £13 1s. 8d. per ton?
4. A has 19 horses worth £18 17s. 6d. each, and he exchanges them with B for 25 cows worth 16 guineas each; how much money should A give B?

Card 27.

1. Make out a bill for the following wages:—2 years' work at £1 7s. 6d. per week; 5 months' work at £1 6s. 9d. per week; 3 weeks' work of 6 days each at 4s. 3d. per day; and 7 hours' work at 6½d. per hour.
2. What would be the cost of 25 yds. 2 ft. 7 in. at 11s. 3d. per yard?
3. What part of a lb. must be added to $\frac{7}{8}$ lb. to make $\frac{10}{11}$ lb.?
4. If 3 quarters of wheat are worth 4 quarters of barley, what should be the price of a bushel of wheat when barley is at £2 16s. 6d. per quarter?

Card 28.

1. An equal number of men, women, and boys earned £70 11s. in six days. Each man earned 4s. 6d., each woman 1s. 8d., and each boy 9d. a day. How many were there altogether?

2. Find the value of 2,916 chairs, the average price being £4 17s. 9¼d.

3. If a bicyclist travel 42 miles in 4 hrs. 30 min. 30 sec., how long will it take him to go 147 miles?

4. What will be the cost for 2 qrs. 13 lbs. 10 oz. at £5 12s. per cwt.?

Card 29.

1. Simplify $(\frac{7}{10} - \frac{1}{6}) - (\frac{4}{7} - \frac{1}{12})$.

2. If a person can perform a journey in 8 days, travelling 9 hours a day, how long will it take him if he travel 12 hours a day?

3. What is the value of a crop on 6 ac. 3 ro. 29⅓ po. at £2 3s. 4d. per rood?

4. Make a bill for:—113 hams of 19 lbs. each at 10¼d. per lb.; 6 score eggs at ¾d. each; 37 pair of fowls at 3s. 11d. per pair; 10 stone of bacon at 8½d. per lb.; and 17 lbs. of cheese at 9½d. per lb.

Card 30.

1. A person owes £17,098 10s., but he can only pay 8s. 5½d. in the pound; how much are his effects worth?

2. What must 40s. pay towards a tax, when £652 13s. 4d. is assessed at £83 12s. 5½d.?

3. What will be the cost of 60 gals. 3 qts. 1 pt. of wine at £123 18s. per hogshead of 63 gallons?

4. A shopkeeper bought 15 dozen hats at 31s. a dozen, and sold them at 3s. 6d. each; what did he gain?

Card 31.

1. Make out the following account:—37¾ yards of Brussels carpet at 3s. 9d. per yard; 28¼ yards of Kidderminster carpet at 2s. 11d. per yard; 15½ yards of felt carpet at 1s. 10½d. per yard; and 19⅔ square yards of linoleum at 2s. 6d. per sq. yard.

2. Find the value of 9,605 articles at £7 18s. 5½d. each.

3. What quantity of sugar can be bought for £324, if 14 cwt. 3 qrs. 14 lbs. of the same kind cost £36?

4. Find the sum of the greatest and the least of the fractions $\frac{2}{3}$, $\frac{1}{4}$, $\frac{5}{7}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{4}{5}$, $\frac{5}{9}$, $\frac{1}{6}$, and $\frac{7}{10}$.

Card 32.

1. What is the value of 1 ton 10 cwt. 3 qrs. 9 lbs. 12 oz. at £16 6s. 8d. per cwt.?

2. A wished to exchange 50 gallons of brandy at £1 10s. 6d. per gallon with B for beer at 1s. 8d. per gallon. How many gallons of beer should he receive?

3. Find the price of four thousand one hundred and ninety-three whips at two for three halfpence.

4. Simplify $(\frac{1}{6} + \frac{4}{5}) - (\frac{2}{3} + \frac{1}{10})$.

Card 33.

1. Find, by practice, the value of 6,550 articles at 7s. 10¼d. each.

2. A poor-rate of one shilling and elevenpence halfpenny in the pound amounts to five pounds and seven half crowns; what is the house rated at?

3. What is the value of 47 qrs. 2 bus. 3 pks. 3 qts. at 9s. 4d. per bushel?

4. Work the following bill:—1 cwt. of indigo at 14s. 6d. per lb.; 1 ton of cloves at 1s. 2d. per lb.; 5 cwt. 3 qrs. 18 lbs. of spelter at 4½d. per lb.; and 7 cwt. 1 qr. 14 lbs. of block tin at £64 per ton.

Card 34.

1. Harry spent $\frac{1}{10}$ of his money, gave $\frac{1}{11}$ away, and lost $\frac{1}{12}$. What part of his money had he left?

2. Find the value of 51,895 articles at £6 5s. 2½d. each.

3. What are a servant's wages for 7 years 7 calendar months at £13 17s. 9d. per year?

4. If a person can ride 300 miles in 8 days of 7 hours 30 min. each, in how many days could he do the same journey if he rode 10 hours a day?

Card 35.

1. Make a bill for:—2½ cwt. of sugar at 3½d. per lb.; 4¼ cwt. of sugar at 4s. 4½d. per stone; 5¾ cwt. of peas at 2s. 11d. per stone; 9½ cwt. of soda at 10½d. per stone; and 11 cwt. of soap at 2¾d. per lb.

2. What is the value of 13 qrs. 7 bus. 3 pks. at £1 10s. 8d. per quarter?

3. If 49 pieces of cloth, each containing 29 yds. 3 qrs., cost £347 15s. 8d., what is the value of 28 pieces?

4. From the sum of $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{9}$, and $\frac{9}{10}$ take the difference between $\frac{7}{8}$ and $\frac{5}{12}$.

Card 36.

1. Find the value of 31,829 houses at £380 18s. 10½d. each.

2. Divide £17 6s. 0½d. among 35 boys and 46 girls, giving a boy three times as much as a girl.

3. Find the price of 19 sq. yds. 8 sq. ft. 106 sq. in. at 13s. 6d. a square yard.

4. A bankrupt's debts are £535 10s. 5d., and his assets £321 6s. 3d.; how much can he pay in the £?

Card 37.

1. What fraction remains after taking $\frac{6}{11}$ from $\frac{4}{7} + \frac{8}{9}$?

2. What is the cost for 15 miles 6 fur. 28 po. at £1 3s. 4d. per mile?

3. How many yards of silk worth 8s. a yard should be given in exchange for 36 yds. of velvet worth 10s. a yd.?

4. Make out a bill for the following:—15 gross penholders at 9½d. per dozen; 45 dozen inkstands at 3s. 6d. each; 75 reams blotting-paper at 10d. per quire; 510 reams foolscap at 9d. per quire; 60 gross lead pencils at 1s. 1½d. per doz.; and 90 dozen penknives at 1s. 4½d. each.

Card 38.

1. Find the cost of 99,999 articles at 15s. 10¾d. each.

2. If the rent of 120 acres is £157 10s., how much rent should be paid for 50 acres?

3. What is the cost of 7 bins of oats, each containing 7 qrs. 7 bus. 3 pks., at £1 8s. 8d. per quarter?

4. A certain number of men, twice as many women, and three times as many boys earned £119 10s. Each man earned £1 5s., each woman 9s. 6d., and each boy 5s. 3d.; how many were there of each?

Card 39.

1. Simplify $\frac{2}{3} + \frac{1}{4} - \frac{1}{5}$.

2. If 45 men can do a piece of work in 15 days, how long will it take 27 men to do it?

3. What is the cost of 293 acres 3 rds. 10 pls. at £1 15s. per acre?

4. A lady's income is £8 per week. She spends £60 17s. per quarter. What does she save yearly?

Card 40.

1. Find the value of 473 books at £4 13s. 2¼d. each.

2. Take $\frac{7}{8} - \frac{3}{4}$ from one.

3. If a man drinks a bottle of wine a day, how much will it cost him yearly if a dozen bottles cost him £1 12s.?

4. If 50 men build a wall in 27 days, how many men could build it in 18 days?

A Prize of HALF-A-GUINEA will be paid to the Teacher w is

LON

ANSWERS.

Card 1.

1. £25.
2. 54 mls.
3. £1,955 9s. 10½d.
4. £7 6s. 8d. gained.

Card 2.

1. 331 ac. 2 rd. 13 pls. 8¾ sq. yds.
2. $\frac{17}{44}$.
3. 45 qrs. 6 bus.
4. £31 14s. 6¾d.

Card 3.

1. £122 14s. 3d.
2. £7,000.
3. £1,075.
4. 128 tons 17 cwt. 2 qrs.

Card 4.

1. £44 3s. 1½d.
2. $\frac{13}{132}$.
3. £753 5s. 3d.
4. 608 miles.

Card 5.

1. £112 19s. 4½d.
2. £2,557 14s. 6d.
3. 10s. 1½d.
4. $2\frac{19}{45}$.

Card 6.

1. £2,640 5s. 3d.
2. 150 days.
3. £3,741 1s.
4. $\frac{87}{815}$.

Card 7.

1. $2\frac{13}{20}$.
2. £31,156 13s. 10½d.
3. 2s. 11¾d. + 7s. 1¼d. + £9 16s. + 5s. 5¼d. + 1s. 10½d. = £10 13s. 4¾d.
4. 12½ hrs.

Card 8.

1. $1\frac{13}{20}$.
2. £91 13s. 6¾d.
3. £81 5s.
4. 8 hrs. 20 min.

Card 9.

1. 12 cwt. 6 lbs.
2. £598 2s. 11½d.
3. 28 hrs. 7 min. 30 sec.
4. $\frac{47}{44}$.

Card 10.

1. £1 5s. 6d. + £2 4s. 6¾d. + £5 6s. 8d. + £21 10s. 8d. + £3 2s. 3d. = £33 9s. 7¾d.
2. £181 3s. 5¼d.
3. $\frac{1}{8}$.
4. £9 2s. 6¾d.

Card 11.

1. 17 sheep.
2. £292 0s. 7½d.
3. $1\frac{9}{12}$.
4. $11\frac{3}{5}$ wks.

Card 12.

1. $\frac{23}{60}$.
2. £1,103 8s. 9d.
3. 75 tons.
4. £619 10s. 4½d.

Card 13.

1. 500 people.
2. 3s. 3d. + 2s. 3d. + 9s. 4½d. + 14s. + 14s. 7½d. = £2 3s. 6d.
3. $2\frac{1}{3}\frac{1}{7}$.
4. £1,284 16s. 9d.

Card 14.

1. 114 jackets.
2. £394 15s.
3. 3s. 9d.
4. $\frac{8}{9}$.

Card 15.

1. 150 mls.
2. £46 3s. 9d.
3. $\frac{1}{2}\frac{1}{3}$.
4. £1,986 15s. 1½d.

Card 16.

1. £37 10s. + 2s. 0¾d. + 11s. 3d. + 12s. = £38 15s. 3¾d.
2. 37 mls. 5½ fur.
3. £1,686 9s. 5d.
4. 81 lbs.

Card 17.

1. £229 10s.
2. $1\frac{1}{3}$.
3. £3,802 3s. 2d.
4. $\frac{3}{5}$.

Card 18.

1. £466 14s. 5d.
2. 9s. 7d.
3. $\frac{1}{8}$ of the cheese.
4. 3 hrs. 6 min. 40 sec.

Card 19.

1. £31 + 10s. 3½d. + 10s. 6d. + £1 7s. + £7 17s. 6d. = £41 5s. 3½d.
2. $2\frac{1}{15}\frac{1}{3}$.
3. £22 17s. 8½d.
4. 13 men.

Card 20.

1. £3,922 5s. 4¾d.
2. £566 15s. 4½d.
3. $\frac{17}{44}$.
4. 31 ft. 6 in.

Card 21.

1. £9 12s. 10d. + £12 3s. + £3 7s. 6d. + £1 18s. 3d. = £27 1s. 7d.
2. £1,001.
3. £52 4s. 9½d.
4. Greatest $\frac{2}{3}$, least $\frac{2}{10}$.

Card 22.

1. £678,012 6s. 0½d.
2. 60 articles.
3. $\frac{3}{13}\frac{0}{5}$ of the cake.
4. £235 0s. 10¾d.

Card 23.

1. 11s. 3d. + 12s. 3d. + 5s. 8d. + £2 2s. 3d. + £1 1s. 10½d. = £4 13s. 3½d.
2. $1\frac{1}{3}$.
3. £5 14s. 7½d.
4. £95 13s. 5¼d.

Card 24.

1. £8,759 17s. 3¾d.
2. 5,760 steps.
3. 90 men.
4. £36 19s. 0¾d.

Card 25.

1. £5,720.
2. £1 6s. 8d. + 6s. + £1 11s. 6d. + 4s. 6d. = £3 8s. 8d.
3. $\frac{1}{110}$.
4. Man £3 15s. 7d., woman £7 11s. 2d.

Card 26.

1. £517 8s.
2. 72 yards.
3. £12 18s. 4¾d.
4. £61 7s. 6d.

Card 27.

1. £143 + £26 15s. + £3 16s. 6d. + 3s. 9½d. = £173 15s. 3½d.
2. £14 10s. 11½d.
3. $\frac{3}{16}$ lb.
4. 9s. 5d.

Card 28.

1. 102 persons.
2. £14,254 19s. 9½.
3. 15 hrs. 46 min. 45 sec.
4. £3 9s. 7½d.

Card 29.

1. $\frac{19}{240}$.
2. 6 days.
3. £60 1s. 11½d.
4. £91 13s. 10¾d. + 7s. 6d. + £7 4s. 11d. + £4 19s. 2d. + 13s. 5½d. = £104 18s. 11¼d.

Card 30.

1. £7,231 4s. 9¾d.
2. 5s. 1½d.
3. £119 14s. 5d.
4. £8 5s.

Card 31.

1. £7 1s. 6¾d. + £4 2s. 4¾d. + £1 9s. 0¾d. + £2 9s. 2d. = £15 2s. 2¼d.
2. £76,099 12s. 3½d.
3. 6 tons 13 cwt. 3 qrs. 14 lbs.
4. $\frac{2}{3}\frac{8}{0}$.

Card 32.

1. £503 13s. 5¼d.
2. 915 gallons.
3. £13 2s. 0¾d.
4. $\frac{1}{5}$.

Card 33.

1. £2,572 4s. 9½d.
2. £60.
3. £176 15s. 10½d.
4. £81 4s. + £130 13s. 4d. + £12 8s. 3d. + £23 12s. = £247 17s. 7d.

Card 34.

1. $\frac{47}{6}\frac{8}{6}$ of his money.
2. £324,884 6s. 5½d.
3. £105 6s. 3¼d.
4. 6 days.

Card 35.

1. £4 1s. 8d. + £7 8s. 9d. + £6 14s. 2d. + £3 6s. 6d. + £14 2s. 4d. = £35 13s. 5d.
2. £21 8s. 4½d.
3. £198 14s. 8d.
4. $2\frac{4}{5}\frac{8}{0}$.

Card 36.

1. £12,125,058 12s. 4½d.
2. Boy 6s. 10½d., girl 2s. 3½d.
3. £13 9s. 7¼d.
4. 12s.

Card 37.

1. $\frac{2}{6}\frac{3}{5}\frac{4}{5}$.
2. £18 9s. 6½d.
3. 45 yards.
4. £7 2s. 6d. + £94 10s. + £62 10s. + £382 10s. + £40 10s. + £74 5s. = £661 7s. 6d.

Card 38.

1. £79,478 7s. 5¼d.
2. £65 12s. 6d.
3. £79 19s. 0¾d.
4. 40 men, 80 women, and 120 boys.

Card 39.

1. $\frac{43}{60}$.
2. 25 days.
3. £514 3s. 5¼d.
4. £172 12s.

Card 40.

1. £2,203 17s. 8¼d.
2. $\frac{1}{3}$.
3. £48 13s. 4d.
4. 75 men.

eacher w is the **FIRST** to point out an Error in the above Answers.

.ONDON: